

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

OVERVIEW

This chapter describes the potential effects on the environment of implementing each of the four alternatives described in Chapter 2. These impacts are presented relative to the existing conditions presented in Chapter 3 and quantified to the extent practical with available data. This Proposed RMP/Final EIS provides a broad scale, “big picture” level of analysis, and the exact locations of projected oil and gas development and other changes are not known at this time. Therefore, the analysis in this chapter represents best estimates of impacts, calculated primarily through GIS applications. Impacts to the resources presented in Chapter 3 are described under each alternative and by each issue that would affect that resource. If an issue is not listed, it is because no impacts to that resource are anticipated.

The primary impacts in the planning area would be due to projected increases in oil and gas activities and would result mainly from surface disturbance. The evaluation of these impacts is based on the number of wells and associated infrastructure projected over the next twenty years in the RFDS (Engler et al. 2001), modified by changes in boundaries and management of SDAs. The impacts would occur mainly in the high development area in the San Juan Basin. New or incompletely developed areas with low potential for mineral resource production lack the geologic data to predict well numbers and to enable more than a qualitative discussion of potential impacts.

Within the FFO area, the analysis addresses revisions to the RMP in all management areas, in addition to oil and gas development. The focus is on the five issue areas described in Chapter 1. The analysis pertaining to USFS and USBR land focuses on the evaluation of the impacts from oil and gas development and

provides information needed to develop the Conditions of Approval of oil and gas leasing and development. This Proposed RMP/Final EIS does not address the comprehensive range of land management issues for USFS and USBR land.

Impacts are defined as modifications to the existing environment brought about by implementing an alternative. Impacts can be beneficial or detrimental, result from the action directly or indirectly, and can be long-term, short-term, or temporary.

Direct impacts are attributable to implementation of an alternative that affects a specific resource and generally occur at the same time and place. Indirect impacts can result from one resource affecting another (e.g., soil erosion and sedimentation affecting water quality) or can be later in time or removed in location, but are still reasonably foreseeable. Long-term impacts are those that would substantially remain for many years or for the life of the project. Temporary impacts are short-lived or ephemeral changes to the environment that return to the original condition once the activity is stopped, such as air pollutant emissions caused by earthmoving equipment during construction. Short-term impacts result in changes to the environment that are stabilized or mitigated rapidly and without long-term effects, such as surface disturbance that is revegetated immediately after earthmoving is completed. Impacts can vary from a slightly discernible change to a full modification or elimination of the environmental condition.

Cumulative impacts are also addressed for each resource. These are the effects of the proposed action in combination with other known and reasonably foreseeable past, present, and future actions within the San Juan Basin.

ASSUMPTIONS AND ANALYSIS

The estimates of long-term disturbance resulting from oil and gas development used for impact analysis are based on assumptions from the FFO and the RFDS developed by NM Tech. To develop the RFDS, NM Tech used GIS coverages of existing wells, examined historic production data, and analyzed production characteristics for each major reservoir in the New Mexico portion of the San Juan Basin to derive the projected number of total available completions (16,615) in the New Mexico portion of the San Juan Basin and their spatial distribution. Of this number of total completions, there would be a 25 percent reduction in well bores due to dual completions and commingling, 80 percent of which would occur on federal minerals, bringing the projected number to 9,970 over the 20-year period of analysis. This is the predicted number of wells that was used as a starting point for determining the number of new wells on federal land under each alternative. To provide an upper limit for analysis, Alternative B assumes no commingling. As explained in Chapter 2, land use planning decisions and management prescriptions were used to determine the actual number anticipated under each alternative.

The RFDS obtained the predicted number of commingled wells by decreasing the total number of locations where reservoirs could be accessed under the same spacing and densities that are allowed by rule to be commingled. The RFDS provided no basis for predicting the number of wells that could be completed through CBM wells drilled using coiled tubing. Therefore, although use of this technology can affect the amount of surface disturbance, it was not evaluated in this analysis.

Although the exact locations of these new wells are not currently known, the RFDS predicted the number of locations on a township-range basis. The locations were predicted using current and expected spacing units and well densities for producing formations in the San Juan Basin. In addition, the production characteristics, including the

extent and amount of remaining reserves for each formation, were analyzed and used to predict the spatial extent of the wells in the San Juan Basin. A detailed explanation of the procedures used to predict the number of wells and areas of oil and gas development is included in the RFDS (Engler et al. 2001).

Surface disturbance caused by the construction and operation of oil and gas wells was estimated by applying the following assumptions, derived from the RFDS and from estimates based on historic data provided by FFO personnel:

- New surface disturbance would occur on 54 percent of all new well bores, while 46 percent would be located on existing sites through re-completion or directional drilling.
- Initial short-term surface disturbance for new well pad construction would average 3.5 acres, with 1.5 acres reseeded and stabilized after construction is completed, resulting in the long-term surface disturbance associated with each new well pad averaging 2 acres, after interim reclamation takes place.
- When using an existing well pad to locate a new well bore, the size of the altered pad would be approximately 2.5 acres, adding 0.5 acre in long-term surface disturbance. It is assumed that no new surface disturbance from road or pipeline installation would occur for co-located wells.
- The road and pipeline disturbance associated with each new well would average 1.5 acres initially (short-term) when accounting for a wider area of disturbance during construction, and 1 acre long-term, after stabilization is completed. An average of 800 feet of road and pipeline would be constructed within the same 50-foot wide disturbed area. Any net increase in water disposal lines associated with the Fruitland

Coalbed Methane activity is assumed to be included in these figures.

- Final abandonment and reclamation would be completed at an initial rate of 133 well pads and associated ROWs per year, averaging 3 acres per well. The plugging and abandonment rate is projected to increase at the rate of 5 percent per year over 20 years. Most P&As would occur in the fringe areas of the project, with abandoned sites in the high development area likely to be used again.
- There is approximately 168,000 HP of existing compressor stations in the San Juan Basin. An additional 360,000 HP of large compression sites are projected in association with the gas gathering systems necessary to support the projected development. The additional compression sites would be scattered throughout the high development area and are projected to include 10 to 20 stations ranging in size from 2,000 to 10,000 HP and 200 to 300 stations ranging in size from 500 to 2,000 HP. In addition, as the field continues to mature, wellhead compression is assumed to increase, with half of the planning area wells having compression averaging 100 HP at any given time over the life of the plan. Total compression could approach 2,278,000 HP.

The total amount of surface disturbance was derived considering the following:

- New wells, roads, and small pipelines, both on newly constructed well pads and on existing well pads;
- Large pipelines;
- Compressor installations; and
- Final reclamation of well pads.

To predict the amount of long-term surface disturbance associated with new wells, the analysis determined how many well locations could reasonably be developed in stipulation-

restricted areas. Subsurface minerals located under a “no surface occupancy” area can be accessed from a surface location within 1,500 feet of the restricted boundary. This distance is a typical achievable offset for a directional well drilled to the Mesaverde/Dakota formations. If the shallower horizons, Fruitland or Pictured Cliffs, are not accessible using directional drilling, the percentage of unrecovered reserves would increase from that estimate. The actual number of wells to be drilled is subject to economic and technological considerations, but the numbers presented under each alternative was used for analysis and comparison. The number of wells predicted to be “not accessible” (greater than 1,500 feet from the NSO area boundary) was subtracted from the total number of predicted wells under each alternative to obtain the remaining number of wells predicted as available for drilling.

To determine how much acreage would be disturbed over the long term through the construction of new wells on new pads, the number of remaining locations was multiplied by 54 percent and then by the 3-acre average long-term disturbance associated with each location (well pad, road, pipeline). To determine the amount of surface disturbance associated with wells drilled on existing well pads, the number of remaining locations was multiplied by 46 percent and then by 0.5, which represents the average incremental acreage necessary to add a well to an existing well pad.

The amount of surface disturbance associated with large transmission pipelines was determined by assuming that the number of compressors and amount of pipeline required under each alternative would vary according to the amount of producible hydrocarbons. The amount of produced hydrocarbons is proportional to the number of completions, which in turn is affected by the number of available surface locations. Reserves producible under Alternatives B, C, and D differ only by the number of locations that would not be accessible due to surface constraints. Most of the available hydrocarbon reserves would be

accessible under those three alternatives through commingling, dual completions, directional drilling, or other innovative drilling techniques. Thus, the number of possible completions is approximately the same for all three alternatives although the number of new surface locations for each alternative varies according to the surface stipulations. The results reflect the largest amount of long-term surface disturbance possible under each alternative. The amount of surface disturbance associated with larger pipelines and compressors was determined by applying the percent of wells removed after applying surface stipulations under each alternative to the amount of acreage listed in the assumptions (11,716 acres for pipelines).

Compressors in the planning area differ in the amount of surface area required for their installation. Wellhead compressors are typically installed on the well pad, requiring no additional acreage. They were assumed to create no new surface disturbance. This analysis assumed that the maximum amount of acreage required for installation of Phase 1 compressors (2,000 to 10,000 HP) would be 10 acres each. The RFDS predicted 10 to 20 Phase 1 compressors would be installed during the period of analysis. This analysis also

assumed that Phase 2 compressors (sized from 500 to 2,000 HP) require 5 acres each for installation. The RFDS predicted 200 to 300 Phase 2 compressors would be installed during the period of analysis. There may be more than one Phase 1 or Phase 2 compressor at a compressor site or station.

The net amount of long-term surface disturbance associated with each alternative was determined by subtracting the amount of acreage predicted for reclamation under each alternative from the total amount of disturbance predicted for well pad construction, larger pipelines, and compressors. There is, however, already a backlog of well pads waiting for field review and approval of final abandonment by the FFO. These locations cannot be considered “reclaimed” until that approval is granted. This analysis did not consider the backlog or how it may impact net surface disturbance in the future. The amount of reclaimed surface was assumed to be the same for all alternatives and calculated according to the FFO assumptions. Initially, 133 well pads at 3 acres each would be reclaimed during the first year, increasing at a rate of 5 percent per year thereafter. This would result in 13,194 acres of reclaimed land at the end of 20 years.

ALTERNATIVE A—CURRENT MANAGEMENT

Surface Disturbance Due to Oil and Gas Development

There would be 4,421 projected new well bores on federal minerals over a 20-year period in the planning area. Over 20 years, this would average 223 wells per year.

The surface area that would be modified for the long-term for construction of new well pads or additions to existing well pads for new well bores, access roads, and small pipelines would total 8,179 acres. Long-term surface disturbance for large pipelines and 114 Phase I and II compressors would total 5,949 acres (**Table 4-1**). Alternative A would involve approximately 44 percent of the maximum number of potential new wells projected in the RFDS.

Table 4-1. Long-Term Surface Disturbance Associated with Well Development under Each Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Total number of predicted new well bores on federal land over 20 years	4,438	13,292	9,970	9,970
Number of well locations not accessible due to NSO constraints	17	17	134	28
Remaining number of locations available for development	4,421	13,275	9,836	9,942
Long-term surface disturbance associated with new wells (acres)	7,162	21,506	15,934	16,106
Surface disturbance associated with existing well pads (acres)	1,017	3,053	2,262	2,287
Total amount of new surface disturbance associated with wells (acres)	8,179	24,559	18,197	18,393
Amount of surface disturbance associated with construction of large pipelines (acres)	5,195	11,716	11,559	11,683
Amount of surface disturbance associated with installation of compressors (acres)	754	1,700	1,677	1,695
Total surface disturbance (acres)	14,128	37,975	31,432	31,771
Amount of reclaimed surface (acres) ¹	13,194	13,194	13,194	13,194
Net amount of surface disturbance (acres)	934	24,781	18,238	18,577

Note: (1) Does not include plugged and abandoned wells that await approval for reclamation.

After 20 years, 13,194 acres would be reclaimed. Because 46 percent of the new wells are assumed to be located on existing pads, the acreage disturbed for new development would be less than that reclaimed on an equivalent number of wells (Table 4-1). Therefore, the implementation of Alternative A would result in a net long-term surface disturbance of 934

acres, without taking into account the plugged and abandoned well backlog that may be approved for reclamation.

Watersheds

Several of the federal agencies in the planning area manage their resource programs on a watershed basis. Information on surface

disturbance by watershed is important to predict short- and long-term impacts on soils, sediment yields, habitat fragmentation, cultural resources, and surface water quality. This section estimates the surface disturbance caused by oil and gas development that is used to analyze impacts on other resources.

The number of wells projected for each watershed in the planning area was calculated using GIS based on the future locations of oil and gas development by township and range in the RFDS. This number was reduced by the number of wells that would not be accessible due to NSO constraints. It was assumed that the initial vegetation clearance and earthmoving would disturb up to 5 acres for well pads and associated infrastructure, representing the term area of surface disturbance that would affect wildlife habitat, soils, and cultural resources. Under Alternative A, there would be 2 wells in SDAs and 6 wells on USBR land under the water surface and the land adjacent to Navajo Reservoir that would not be accessible.

Surface disturbance, especially bare soil on unpaved roads, is a major contributor to changes in sediment yield in a watershed. Actual sediment yields resulting from projected oil and gas development and other surface disturbing activities could not be quantified for this analysis because site-specific locations of the new wells, roads, pipelines, compressors, and trails would be needed. It has been shown through a recent study (Phippen 2000) in the Rio Puerco watershed in Sandoval County, New Mexico, that sediment yields are highly sensitive to changes in the density of unpaved roads. In a commonly used procedure to estimate sediment yields from large watersheds (PSIAC 1968), approximately 8 percent of the sediment yield predicted is influenced by the amount of ground cover. In general, it can be concluded that areas with the highest density of development, the least ground cover, and the

most erodible soils would generate the highest sediment yields. Therefore, the analysis focuses on quantifying changes in surface disturbance, amount of vegetation disturbed, and road density, with the assumption that increased sediment yields would be related to increases in these watershed parameters.

Table 4-2 shows the amount of initial surface disturbance estimated for each watershed under each alternative. **Table 4-3** estimates the increase in new roads within each watershed by alternative.

Under this alternative, initial surface disturbance is estimated to total approximately 13,971 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors shown in Table 4-1. Without knowing the locations of the proposed large compressors and lateral and trunk lines, it is not possible to determine which watersheds would receive the impacts of this construction, except to assume that the majority of the earthmoving would be located in the high development area in the northern part of the planning area (Map 2-1). The largest anticipated acreage of surface disturbance would be in the high intensity oil and gas development area in the Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, and Blanco watersheds, in descending order.

Under this alternative, there would be an increase ranging between 12 and 77 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging from 1 to 6 percent in those watersheds. The total increase would be approximately 358 miles in the planning area, which would result in a slight increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Table 4-2. Initial Surface Disturbance from Oil and Gas Development under Each Alternative by Watershed

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)
Animas	389	1,230	1,166	3,685	874	2,763	874	2,763
Arroyo Chico	0	0	0	0	0	0	0	0
Blanco	301	950	903	2,855	670	2,141	677	2,514
Carrizo	465	1,470	1,394	4,406	1,037	3,304	1,046	3,879
Chaco Wash	32	100	95	300	71	225	71	264
Chinle	0	0	0	0	0	0	0	0
Gobernador	189	597	566	1,790	418	1,342	424	1,576
Kutz Canyon	123	388	368	1,163	276	872	276	1,024
La Plata	304	961	911	2,879	683	2,159	683	2,534
Largo	810	2,561	2,427	7,669	1,816	5,754	1,811	6,756
Mancos	0	0	0	0	0	0	0	0
Middle San Juan	143	451	428	1,352	321	1,014	321	1,190
Navajo Reservoir	552	1,744	1,679	5,347	1,182	4,010	1,256	4,707
Pump Canyon	150	473	448	1,416	336	1,062	336	1,246
Rio Chama	7	23	21	5	16	5	16	5
Rio Puerco	1	4	3	9	3	10	3	12
Rio San Jose	0	0	0	0	0	0	0	0
Upper Puerco	0	0	0	0	0	0	0	0
Upper San Juan	955	3,019	2,866	9,065	2,133	6,798	2,148	7,981
Total	4,421	13,971	13,275	41,941	9,836	31,459	9,942	36,451
Total Acreage to be Revegetated		4,598		13,806		10,229		10,339

Note: In some cases, acreage varies for the same number of wells due to rounding.

Table 4-3. Increase in New Roads under Each Alternative by Watershed

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change
Animas	31	3%	94	10%	71	8%	71	8%
Arroyo Chico	0	0%	0	0%	0	0%	0	0%
Blanco	24	4%	73	13%	54	10%	55	10%
Carrizo	38	5%	113	14%	84	11%	85	11%
Chaco Wash	3	0%	8	0%	6	0%	6	0%
Chinle	0	0%	0	0%	0	0%	0	0%
Gobernador	15	6%	46	18%	34	13%	34	13%
Kutz Canyon	10	5%	30	16%	22	12%	22	12%
La Plata	25	6%	74	17%	55	13%	55	13%
Largo	66	2%	196	7%	148	5%	147	5%
Mancos	0	0%	0	0%	0	0%	0	0%
Middle San Juan	12	1%	35	2%	26	1%	26	1%
Navajo Reservoir	45	4%	136	13%	96	9%	102	9%
Pump Canyon	12	6%	36	18%	27	13%	27	13%
Rio Chama	1	0%	2	0%	1	0%	1	0%
Rio Puerco	0	0%	0	0%	0	0%	0	0%
Rio San Jose	0	0%	0	0%	0	0%	0	0%
Upper Puerco	0	0%	0	0%	0	0%	0	0%
Upper San Juan	76	3%	232	10%	173	7%	174	7%
Total	358		1,075		797		805	

Note: In some cases, percentage varies for the same miles of road due to rounding.

Most of the soils in the watersheds with the most acreage of predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls and other BMPs.

Geology and Minerals

The primary impact to mineral resources under all alternatives would be the irretrievable commitment of oil and gas resources in the San Juan Basin. The hydrocarbons produced from federal lands would no longer be available for future use. Extraction of oil and gas resources in the planning area would vary according to the ability to access subsurface hydrocarbon resources under each alternative.

Oil and Gas Leasing and Development

Access to hydrocarbon reserves in a particular formation is regulated by spacing and density rules. Well spacing units and the option to perform infill drilling affect the ability to extract mineral resources. The RFDS anticipates that spacing and/or density rules would be altered over the 20-year period of analysis to maximize extraction of hydrocarbon resources. For example, the Fruitland Coal is currently drilled on 320-acre spacing. It is expected that spacing may be decreased to 160 acres, particularly outside of the high development area. The Dakota formation is currently spaced at 320 acres, with one infill well allowed. It is expected that the spacing may be decreased to 80 acres in order to maximize extraction of its gas resources.

The application of constraints associated with SDAs can affect the ability to access the surface to drill a well. Some lease stipulations or COAs can preclude use of the surface for drilling, such as the conditions of “no surface occupancy.” The minerals beneath an area with a NSO restriction may not be accessible unless the reserves can be accessed through directional drilling. Other constraints can impose use conditions, such as “controlled surface use” or “closed to new leasing.” Use restrictions can be imposed by different factors, including wildlife use, which may result in seasonal timing limitations.

The amount of gas or oil produced under each alternative depends upon the number of completions associated with the alternative. Approximately 84 percent of these wells would be located on FFO BLM land, 10 percent on AFO BLM land, 1 percent on USBR land, and 5 percent on USFS land.

The analysis focused on gas reserves contained in the major gas-producing formations in the San Juan Basin because of their relative importance as compared to oil production. In order to assess how much gas would be produced under each alternative,

the analysis used RFDS estimates of the reserves remaining in each of the major-producing formations. The following assumptions were made to allocate those reserves to each alternative:

- The amount of remaining hydrocarbons was assumed to be producible within the 20-year period of analysis. It is likely that full production would take longer than 20 years, but the RFDS did not provide a timeframe for the ultimate depletion of the various reservoirs, so this assumption was used as the most severe condition for analysis of environmental impacts. It provides a relative basis for estimating the impacts to production by alternative.
- The amount of producible hydrocarbons corresponds to the number of possible completions, which approximately corresponds to the number of possible locations under Alternative B.
- The number of potential completions under Alternatives C and D would be approximately the same as for Alternative B, but more use would be made of alternative drilling and production techniques (commingling, dual completions, directional drilling, etc.). The number of total completions for all alternatives was reduced by the number of locations that would be removed from use by the application of surface stipulations.
- The number of locations in Alternatives A and B is approximately equal to the number of completions.

Remaining reserves for the Pictured Cliffs, Mesaverde, Dakota, Chacra, and Fruitland Coal were provided in the RFDS. The RFDS also provided estimates for the subsurface development associated with Alternative B (Engler et al. 2001). Ratios of available locations to possible locations were generated and applied to the estimated remaining reserves for each formation to provide production estimates for each alternative, shown in **Table 4-4**.

Table 4-4. Estimated Future Production by Alternative

	Remaining Production Estimates from RFDS	Alternative A	Alternative B	Alternative C	Alternative D
Estimated number of wells after stipulations	---	4,421	13,275	9,836	9,942
Formation	Estimated Future Production in Billion Standard Cubic Feet (Bscf)				
Fruitland Coal	1,167	514	1,167	1,151	1,164
Pictured Cliffs	441	194	441	435	440
Mesaverde	6,034	2,655	6,034	5,950	6,016
Dakota	3,368	1,482	3,368	3,321	3,358
Chacra	148	65	148	146	148
Total	11,158	4,910	11,158	11,002	11,125
Percent of Total	---	44%	---	98.6%	99.7%

This analysis provides a relative comparison of production under each alternative. Therefore, under Alternative A, produced gas would be approximately 44 percent of the amount produced under Alternative B. Under Alternatives C and D, the amount produced would be approximately 98 and 99 percent, respectively, of the amount produced under Alternative B.

Implementation of Alternative A would limit accessibility to hydrocarbon reserves by limiting APD approval to approximately 223 per year. A total of 4,421 new wells would be developed under this alternative. NSO restrictions would require 73 directional wells (1.7 percent of the total) to be drilled to access reservoirs under SDAs and Navajo Lake. The actual number of wells approved would be limited by the spacing and density rules for the formations and the locations of the existing wells in the area. Once the P&A wells are taken into account over the 20-year period, there would be no net increase in surface disturbance, and possibly a decrease. The number of wells awaiting approval for reclamation in the FFO backlog would probably decrease over the period of analysis if FFO surface management staff devotes time to

inspection of reclaimed sites. There would be 53,216 acres closed to new leasing.

The limiting factor in production would be the number of wells permitted. Under those conditions, the inability to drill infill wells would not affect resource extraction. Approximately 44 percent of the available gas would be produced under currently accepted technologies. The discontinuance of pilot programs that evaluate innovative techniques to enhance production would further limit extraction of hydrocarbon resources.

On USBR lands, after consideration of the surface constraints near Navajo Reservoir, 58 directionally drilled wells could allow access to hydrocarbon reserves located beneath the reservoir and adjacent land.

Small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells. Consequently, it is anticipated that an increase in the number of new well pads would increase the number of quarries in the high development area. Therefore, the smallest number of small quarries would be constructed under Alternative A. These small quarries would be located in areas that avoid impacts to natural

and cultural resources, permitted by FFO staff either with an APD or through other BLM permitting procedures.

Land Ownership Adjustments

Under current management, 280,782 acres of public land would be available for disposal, of which approximately 264,797 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. The issues surrounding the management of split estate are discussed further under Lands and Access.

There is the potential for conflicts between competing resource users if oil and gas wells and associated infrastructure limit access to the most desirable salable minerals areas located in the vicinity of the tri-cities area, which is also within the high development oil and gas area. Locatable minerals would not be affected by oil and gas development. These potential large quarries would also be required to go through the FFO permitting process that includes cultural, T&E species, and paleontological resource clearances.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas is the limitation imposed in these areas for how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within SDAs, there would be 1 well that would not be accessible and approximately 15 wells that could be developed if directional drilling were used.

Coal Leasing Suitability Assessment

There would be fewer potential conflicts for mineral extraction, especially in the coalbed methane-producing formations, under this alternative because the total number of oil and gas wells approved over the next 20 years would be the lowest of all the alternatives. Conflicts over leases and operations arise when

gas and coal are found in the same coal seam. Areas identified as suitable for coal development are those within the Coal Belt SMA, the 14 PRLAs, and the 17 competitive coal tracts carried forward from previous land use planning. No new lands would be considered for coal leasing outside of these previously designated areas. These areas are outside of the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources. The unsuitability criteria, established by the MLA, and adjudication of some of the PRLAs would have the potential to further reduce the 138,000 acres of federal minerals available for coal mining in these areas.

The renewed interest in the vicinity of Star Lake is in an area with few oil and gas wells projected. Management of the coal program would be implemented as it is currently, so that any land under new application for mining would be evaluated against the unsuitability criteria (Appendix C), and an RMP amendment would be completed to evaluate the site-specific impacts. The Coal Belt SMA would remain, but approval of any mining in this area would require the same evaluation as in other areas under FFO management.

Soils

The alternatives would generate impacts on soils by contributing to soil erosion or compaction from earthmoving activities and OHV use. There is also a potential for changes to prime farmland soils.

The analysis of impacts on soils examined activities associated with each alternative that could increase erosion or compaction or affect prime farmlands. The removal of vegetation and organic matter from the soil surface, and damage to soil crusts, would cause accelerated soil erosion by water and wind. The construction of new unpaved roads would result in many areas that would concentrate the flow of surface water and contribute additional sedimentation from the road surface and road banks. The amount of water erosion depends on such factors as the terrain at the site of the

surface disturbance, the erodibility and permeability of each soil type, vegetative cover, the steepness and length of the slope at the site, and the amount of precipitation.

The amount of wind erosion would also be affected by the location and type of barriers to the prevailing winds at the site. Without knowledge of the exact locations of surface disturbance, it is impossible to predict the quantity of soil that would be lost due to the site-specific nature of soil erosion prediction methods.

Indirect impacts would include the potential for increased salinity and sedimentation in waterways due to erosion. The Upper San Juan watershed contains a relatively high proportion of saline soils compared to others in the planning area and is the area of the highest projected surface disturbance due to oil and gas development. Others with saline soils in the San Juan Basin subject to potential surface disturbance and resulting erosion are the La Plata, Animas, and Middle San Juan watersheds.

Soil compaction is caused by heavy equipment, especially if the soil contains a high proportion of silt and clay or when it is wet. Soil compaction would result in damage to soil crusts, decreased soil permeability and plant rooting depth, and increased surface water runoff, contributing to accelerated erosion and flooding downstream. Compaction would make revegetation of disturbed areas more difficult. Other localized impacts to soils include mixing of soil horizons and possible contamination of soils from various chemicals and other pollutants used during oil and gas activities.

Prime farmland soils are found in five of the watersheds projected to have high amounts of new oil and gas activity, including Upper San Juan, Navajo Reservoir, La Plata, Animas, Pump Canyon, Middle San Juan, and a small amount in Chaco Wash. Excavation of topsoil and compaction of prime farmland soils would result in changes to these soils unless the soil horizons are stockpiled separately and spread across the site in their original order during reclamation.

Oil and Gas Leasing and Development

Due to the lower numbers of projected new well locations, roads, and pipelines, this alternative would have the least short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 13,971 acres, with 4,598 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 900 acres (Table 4-1). The resulting impacts to soils would be a slight increase in soil erosion due to the increase in bare ground and unpaved roads, without taking into account the P&A backlog that could reduce long-term surface disturbance acreage. There is the potential for impacts to prime farmlands due to construction associated with oil and gas development because the watersheds with the most prime farmland soils are within the high development area for oil and gas.

OHV Use

Open OHV access over most of the FFO area would result in damage to vegetation and soil crusts, and an increase in tracks that could turn into new roads. As vegetation is damaged on sloping terrain, tire tracks oriented up and down the hillside often concentrate surface water runoff during storm events, which develop into gullies. BLM staff has documented damage to vegetation and resulting erosion after an OHV event in the FFO area (O'Neill 2001). Increased soil erosion would also be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce vegetative cover.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A

majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and has low susceptibility to wind erosion, both of which would be accelerated if new coal mining operations were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Criteria used for evaluating impacts to water resources are related to water quality, water availability, and adherence to applicable local, state, and federal regulations. Impacts were evaluated by their potential to impair water quality; reduce water availability to users; endanger public health or safety by creating or worsening health hazards of safety conditions; or violate laws or regulations adopted to protect or manage water resources. Impacts to surface water resources would be considered significant if local, state or federal water quality standards were exceeded, or changes in surface flow exceeded normal maximum or minimum levels as a result of the action. Impacts to groundwater resources would be considered significant if aquifers were altered sufficiently to affect established uses, water quality were degraded below applicable water quality standards, or the quantity of usable groundwater were diminished as a result of the action.

In general, direct impacts to surface waters would result from an increase in surface

disturbance, which could result in an increase in sedimentation in water bodies. Vegetative cover serves as a buffer between the impacts of erosive forces such as rain, wind, and surface water runoff to hold soil in place. As vegetation is removed (through construction activities, OHV use, etc.), soil becomes exposed to these erosive forces. During storm events these soil particles are transported downslope and into drainages. The closer the surface disturbance is to a water body, the more likely it is for sedimentation to enter a water body and affect water quality. When vegetation is disturbed along the riparian corridor, erosive forces can have detrimental impacts to channel stability, resulting in increased bank erosion, channel scour, and sedimentation.

In general, the STCs for oil and gas development and the groundwater protection programs, implemented by federal agencies to comply with federal and state laws, would minimize the potential for impacts to groundwater quality.

Oil and Gas Leasing and Development

The primary issues and concerns regarding water resource problems caused by oil and gas development involve the potential for increased runoff and resulting sedimentation from surface disturbance; water consumption and use; and groundwater contamination associated with various activities from oil and gas development. Increased runoff and associated sedimentation of local drainages could result from and increase in the areal extent of disturbances associated with well, road, and pipeline construction.

Well construction could affect surface water within the immediate vicinity of drill pads and road and pipeline construction could affect surface water along the ROWs. These localized impacts would result from accelerated erosion during storm events that occur when the soil is exposed. The magnitude of potential impacts would be dependent, in part, on seasonal variation in rainfall and snowmelt runoff when the surface disturbance occurs. Should runoff

events occur at times when the surface soil is bare, there would be a higher potential for increased sediment yield, which affects water quality. The magnitude of potential impacts would also depend on the proximity of the drill site, pipeline, or road to receiving bodies of water. If there is a sufficient vegetative buffer between the surface disturbance and any receiving water body, the impacts would be less.

Potential impacts to surface water quality also could occur from accidental contamination associated with spills of machinery fuels, lubricants, and drilling fluids. The potential for impacts to groundwater quality would be limited to drilling, well development, well testing activities, contamination from infiltration of polluted water in unlined pits, and disposal of produced water into injection wells.

During the well-drilling phase, impacts to water resources include the potential to contaminate a freshwater zone. To protect near-surface aquifers, surface casing is installed to a depth of up to 500 feet, depending on the depth necessary to penetrate past the freshwater zones. The casing is pressure tested to ensure a seal has been created to protect the freshwater zones.

Normal drilling usually exposes aquifers for only a short period of time, usually one week or less. Onshore Order No. 2 requires that all useable aquifers be protected by casing or cementing. Drilling systems use low circulation and low fluid loss materials in the drilling operation. Monitoring of make up water is used to verify that water is not entering or leaving the system.

As drilling proceeds, losses of produced water or mud may occur to differing degrees in various formations, but these losses are considered to be minimal and contained to within a few feet of the well bore. These losses are not considered to be substantial because of the very small amount of groundwater that could be affected. It would be unlikely for groundwater contamination to occur as a result of drilling activities.

All water produced in association with Fruitland CBM production would be transported via truck or pipelines to an injection well, or evaporation ponds, for disposal. Injection of produced water is consistent with BLM policy and the USEPA's Underground Injection Control permit Program (40 CFR Part 144). When water is disposed of underground, it is always introduced into a formation containing water of equal or poorer quality or a formation that has been specifically exempted by the NMOCD.

In general, the STCs required to be implemented by the federal agencies would minimize the potential for impacts to groundwater quality.

All alternatives would require some fresh water for well drilling. Drilling operations would account for most of the water actually consumed during the life of the producing wells. A small amount of water would be used for dust suppression or equipment installation during other phases of development. Recirculating mud systems or produced water would be used to reduce the total volume of water needed where appropriate and applicable. Fresh water used in drilling operations would be obtained from the San Juan and Animas Rivers, Navajo Reservoir, local municipalities, and/or from wells drilled specifically for this purpose. The water would be trucked to the location from its source to the reserve pits at each drilling well.

The amount of water used during drilling would depend on the technique used to drill the well bore. Wells that are drilled by using air or another gas as the primary drilling medium require less water than those drilled with mud. Formations that contain greater amounts of fluid, such as the CBM-producing Fruitland formation, are usually drilled with mud to maintain the integrity of the well bore.

The average amount of water needed for drilling and completion differs per formation, ranging from 2,000 barrels (67,200 gallons; 1 barrel = 42 gallons) for Pictured Cliffs to 12,000 barrels for the Mesaverde. Water requirements differ depending on the technique

and the formation. The average amount of water needed for drilling and completion of all wells, weighted by the percentage of wells in each of the major formations in the planning area, is approximately 6,750 barrels per well. If completing a different formation or zone, an additional 10 percent of the amount of completion water would be needed after the initial hole has been drilled.

Under Alternative A, new oil and gas development would result in a slight net increase in surface disturbance. Water required for the drilling operations would amount to 3,113 acre-feet. Water used to drill wells would come from legal water rights holders.

In general, potential impacts to water resources would result from an increase in sedimentation due to surface disturbance. These would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations. There would be a slight long-term net increase in sedimentation because development of new drilling sites would result in reclamation of old sites. There would be a slight increase in potential impacts to water resources in the short term as a result of sedimentation, due to initial increased acreage of surface disturbance during construction.

Land Ownership Adjustments

Modification of the BLM ownership pattern would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result. For instance, the non-federal in-holdings within a designated River Tracts SMA would be targeted for acquisition by the BLM, which could have indirect impacts to water resources due to restrictive management guidelines that would limit surface disturbing activities. Conversely, disposal of BLM land for development in the tri-cities area could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative A are currently unknown. Therefore, it is not possible to

analyze potential impacts to water resources. When these uses are proposed, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

The primary concern regarding OHV impacts on water resources is the potential for increased runoff and resulting erosion and sedimentation due to vegetation degradation, soil compaction, and surface disturbance caused by OHVs. Other concerns include the potential for small fuel spills from OHVs, and OHV travel in riparian areas or surface waters, which would increase sedimentation through mechanical degradation of the riparian vegetation and/or channel bank.

Potential impacts to water resources from cross-country OHV travel would result from an increase in sedimentation due to surface disturbance and compaction. The primarily open designations for OHVs in the FFO area would adversely impact vegetation condition and soil crusts, which in turn, would result in increased runoff and sedimentation of waterways. The level of impact would depend on the specific location and season of OHV use. Use of unpaved roads and trails can create gullies in which rainfall is channeled, resulting in increased flow rate, which ultimately results in increased erosion and subsequent sedimentation of surface waters. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

SDAs are delineated to allow for particular uses in areas that are considered to be ecologically appropriate for the given use, while restricting activities that would negatively impact the identified resource value to be protected. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting

minimization of sedimentation. In situations where OHV cross-country travel would be permitted within an SDA, a localized negative impact to water resources could result. The management prescriptions in the majority (91) of SDAs provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in a small percentage (less than 20 percent) of the total FFO area, however.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if additional coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required. Site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

The primary impact to air quality from the project alternatives would occur from proposed natural gas development and production. This section describes the analysis used to estimate potential air quality impacts from this development, in addition to potential impacts from proposed changes in OHV designations. The changes proposed for coal leasing, land ownership patterns, and SDAs would have minimal effects on air quality so they are not addressed in this section.

This air quality analysis includes an evaluation of near- and far-field pollutant

impacts from gas production with the use of dispersion modeling to determine if proposed emissions contribute to a predicted exceedance of an ambient air quality standard. Information on project emission sources was obtained from gas industry representatives, equipment vendors, the NMAQB, and recent NEPA documentation of gas development in the region (SAIC 2003). The air quality analysis also qualitatively evaluates the impact of proposed gas production emissions to visibility levels in pristine PSD Class I areas in proximity to the planning area. Detailed estimates of equipment usage and resulting emissions for each project alternative, in addition to supporting data that documents the modeling analyses, are included in an Air Quality Technical Report (SAIC 2003). Appendix J presents data used to estimate annual air emissions from the Proposed RMP/Final EIS alternatives.

Alternative B proposes the greatest amount of gas development and therefore potentially would produce the highest air quality impacts of any project alternative. Therefore, the project air quality analysis focused on the impacts from Alternative B. Impacts from all other project alternatives were factored from impacts estimated for this alternative. If impacts from Alternative B would not exceed any air quality standard, it is expected that this would be the case for all other project alternatives.

For the purpose of conducting a reasonable, but conservative, air quality analysis, it was assumed that all new wells would extract natural gas. The following activities would produce air quality impacts under all of the project alternatives:

1. Gas well development, including well drilling, testing, and construction of roads, well pads, pipelines, storage tanks, and compressor stations. Air quality impacts would occur from (a) combustive emissions due to the operations of mobile and stationary source equipment and (b) fugitive dust emissions (PM₁₀) due to earthmoving

activities and the operation of vehicles on both unpaved and paved surfaces. This activity would produce short-term impacts, as the time to complete individual wells is generally between one and two months.

2. Gas well production and the operation of associated gas-fired sources, such as wellhead compressors, water separator units, condensate tank heaters, dehydrators, and compressor stations. Air quality impacts would also occur due to combustive emissions and fugitive dust emissions from the operation of mobile source equipment that access and service well sites. The mobile equipment would operate on both unpaved and paved surfaces.
3. Gas well abandonment, use of mobile equipment, and reclamation of disturbed ground surfaces.
4. Operation of mobile source equipment for overburden and coal handling and stationary coal handling equipment. Air quality impacts would occur from combustive and fugitive dust emissions.
5. Land use policies that would affect the level of off-road mobile sources and ground-disturbing activities on FFO lands.

The air quality analysis in this Proposed RMP/Final EIS includes the following assumptions:

1. Annual well development would occur at a constant rate equal to the total number of wells proposed under each alternative, divided by 20 years.
2. Production for each well under an alternative would occur at a constant annual rate regardless of age (year one and up to year 20). In other words, all developed wells would have the same

annual production rate. The estimate of annual well production was based on the total number of well-years over a 20-year period divided by the total production proposed under each alternative. As a result, peak annual production and emissions from each alternative would occur at the end of the 20-year period of analysis.

3. Loss of production and its associated emissions from P&A wells during the 20-year project period would offset a portion of the production and its associated emissions from each project alternative. To estimate the net change in production and emissions within the region due to a project alternative, the loss in production from P&A wells was subtracted from the production assumed for a project alternative. With an annual growth rate of 5 percent, the number of P&A wells would increase from 133 in year 1 to 336 in year 20, with a total of 4,398 P&A wells over the 20-year period. The annual production per P&A well was calculated to be the existing production in the project region (1.1 trillion standard cubic feet [Tscf]) divided by the number of existing wells (19,790), then divided by 2 to represent the reduced production associated with these old wells.

Oil and Gas Leasing and Development

Alternative A proposes to develop 4,421 new gas wells on federal lands, which would produce approximately 3,718 Bscf of gas over the 20-year life of the alternative. **Table 4-5** presents the emissions that would occur from gas production under Alternative A for the first and last year of the 20-year period. These data show that the overwhelming majority of emissions from this activity would occur from wellhead and central compression demands.

Implementation of Alternative A would result in a gradual increase in gas production and associated emissions from current levels in the San Juan Basin, as the loss of production in

future years from existing wells and formations due to P&A wells would not completely offset the amount of new production from the alternative.

Table 4-5. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative A (Tons per Year)

Equipment Type/Scenario	VOCs	CO	NOx	PM ₁₀
Project Year 1				
Wellhead Compression	25.8	1,124.4	1,133.0	0.0
Separator Units	0.4	2.7	6.3	0.5
Central Compression	24.7	67.7	86.1	0.0
Alternative A - Tons per Year	50.9	1,194.8	1,225.4	0.5
P&A Wells - Tons per Year	(8.3)	(340.9)	(344.9)	(0.2)
Alternative A Net Change (Alt A – P&A)	42.6	853.8	880.5	0.4
Project Year 20				
Wellhead Compression	517.0	22,487.8	22,660.1	0.2
Separator Units	7.4	53.5	125.7	10.2
Central Compression	493.4	1,354.3	1,721.7	0.1
Alternative A - Tons per Year	1,017.7	23,895.5	24,507.5	10.4
P&A Wells - Tons per Year	(273.7)	(11,273.8)	(11,404.7)	(5.1)
Alternative A Net Change (Alt A – P&A)	744.1	12,621.7	13,102.7	5.3

Note: Totals do not sum due to rounding.

Near-field ambient pollutant impacts due to gas production under Alternative A could approximate those estimated for Alternative B, if the density of development in a localized area for Alternative A was similar to what was assumed for Alternative B. This situation would occur in the vicinity of a high concentration of gas wells and a compression station. However, the potential for this to occur under Alternative A would be low, as the amount of development proposed for the alternative is substantially less than the development proposed for Alternative B.

Ambient impacts to nearby Class I areas and O₃ levels from Alternative A would be equal to those estimated for Alternative B, multiplied by the ratio of annual emissions between Alternative A and Alternative B.

Therefore, impacts from Alternative A to these air quality issues of concern would be about 21 percent of those estimated for Alternative B.

OHV Use

Operation of OHVs can produce air quality impacts as a result of combustive and/or fugitive dust emissions. Continuation of the present OHV policies under Alternative A would not be expected to result in any significant air quality impacts. The air quality impact of greatest concern from this activity would be intense vehicular usage on unpaved surfaces in proximity to residential areas or main roadway systems.

Coal Leasing Suitability Assessment

Coal mining would result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreages of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

The amount of land currently and potentially affected by oil and gas development and operations was determined through GIS analysis. The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

Oil and Gas Leasing and Development

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be over 14,000 acres (Table 4-1). Initial short-term surface and vegetation disturbance during construction would affect almost 14,000 acres, of which 4,600 acres would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period of impacts considered, resulting in direct impacts to vegetation. Surface disturbance facilitates the

germination of noxious weeds, and equipment that travels from site to site transports weeds, resulting in the spread of noxious weeds if left uncontrolled.

Land Ownership Adjustments

Approximately 280,800 acres would be available for disposal and 128,000 acres for acquisition under Alternative A (Table 2-1 and Map 2-2). The disposal of land could have negative effects on upland and riparian vegetation if land disturbance activities were to take place. Biological surveys would be conducted on parcels of land designated for disposal to identify sensitive habitats and species. If sensitive plant communities were identified in these parcels, measures to reduce the impacts on these areas could be taken, such as exclusion of specific parcels of land from consideration for transfer and placing restrictions on the use of transferred land. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities especially if the land were acquired in support of a resource program such as riparian areas along the rivers and washes on FFO land.

OHV Use

OHV travel in upland plant communities can result in direct plant mortality and indirect effects through soil disturbance, soil compaction, damage to biological soil crusts, and the promotion of increased erosion. The amount of land open to OHV use under Alternative A would be 1,230,839 acres (Table 2-2). The remaining FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities.

Specially Designated Areas

There would be no modification or addition of SDAs for biological resources under Alternative A. Many of the areas have management prescriptions that limit vegetative disturbance such as surface disturbing activities,

OHV access, or grazing. This management would continue to protect vegetation in a limited part of the FFO.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases have the potential to affect a large amount of land; the currently permitted sites cover over 3,900 acres. Proposed coal operations would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

Oil and Gas Leasing and Development

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 2,500 acres of public land in the River Tracts SMA. There are many other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from wells to be installed in the high development area, although the impacts under Alternative A would be the least because the projected well numbers would be less than under the other alternatives. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401

of the New Mexico Water Quality Control Act (NMWQCA).

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts SMA would not be included in land being considered for disposal.

OHV Use

OHV use of the river tracts and other protected riparian areas on FFO land is limited to designated roads and trails. OHV traffic in intermittent washes would be allowed unless specifically prohibited (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in increased erosion and runoff. The continuation of OHV traffic in dry washes would continue to degrade these areas.

Specially Designated Areas

CSU constraints in 56 SDAs under Alternative A would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources.

Coal Leasing Suitability Assessment

Coal mining operations would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal extraction activities could lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified under Alternative A for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required

once a location has been requested for consideration before this could be accurately addressed.

Special Status Species

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur in the planning area. Such measures are also in place for some of the other special status species. These measures would remain in place as part of continuing management guidance.

Oil and Gas Leasing and Development

Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described above.

Federally Listed and Proposed Species

Knowlton's Cactus. A fence protects the population of wild Knowlton's cactus on FFO land and no disturbance inside the fence would be allowed. The Knowlton's cactus transplant and seed plots on FFO lands are fenced and protected from disturbance. Unoccupied potential Knowlton's cactus habitat within Reese Canyon RNA receives special management. Future roads and well pads within the Reese Canyon RNA would be located outside of unoccupied potential habitat, and pipeline rights-of-way would be authorized only after extensive biological surveys are conducted. Stringent rehabilitation of disturbed ground would be required.

Mesa Verde Cactus. All known and potential habitat for the Mesa Verde cactus on FFO land are contained in The Hogback

ACEC. There are several populations of the Mesa Verde cactus within The Hogback ACEC boundary. Extensive biological surveys would be required for all proposed projects. Any projects that would result in ground-disturbing activities that would negatively impact Mesa Verde cactus would require formal consultation with the USFWS before the project could be authorized.

Mancos Milkvetch. All known populations and potential Mancos milkvetch habitat on FFO land occur in The Hogback ACEC. Extensive biological surveys would be required for all proposed projects that would result in ground disturbance. Any projects that would result in ground-disturbing activities that would negatively impact Mancos Milkvetch would require formal consultation with the USFWS before the project could be authorized.

Colorado Pikeminnow and Razorback Sucker. Until 1987, the Colorado pikeminnow and razorback sucker were considered to be extirpated from the San Juan River due, in part, to activities associated with the construction of Navajo Dam and the Navajo Indian Irrigation Project from 1962 through 1965. Since 1987, 14 adult and 20 young-of-the-year pikeminnow have been captured in the San Juan River and its tributaries between Lake Powell and Shiprock, New Mexico. No wild Colorado pikeminnow or razorback suckers have been detected in the planning area. Concerns regarding the potential for oil and gas development activities to result in polynuclear aromatic hydrocarbon (PAH) releases into the aquatic habitat in the planning area resulted in the FFO initiation of a study of potential releases of PAHs into the environment. This study began in 1994. Based on the previous 8 years of data, the FFO concludes that authorized oil and gas activities are not contributing PAHs that would negatively affect the continued existence and recovery of the Colorado pikeminnow or the razorback sucker (Wirth 2002). Developers and operators of the oil and gas facilities on BLM land in the San Juan River basin would continue to follow BMPs to prevent erosion and

the escape of contaminants from their operations.

Bald Eagle. Oil and gas development and operations have the potential to affect wintering bald eagle through the direct loss of habitat or disturbance of birds from human activity. To protect bald eagles, the Bald Eagle ACEC Activity Plan (BLM 1992) was finalized in 1992. The plan identified 37 units totaling 4,141 acres. The major objective of this plan was to protect the most important bald eagle wintering habitat, as well as to protect the bald eagles that use these areas in the winter. Generally, the ACEC units consist of a “core” area of habitat that is actually used by eagles and a buffer area of approximately 1/4 mile of habitat not used by the eagles. No disturbance of core areas would be allowed at any time of year unless formal consultation with the USFWS is conducted. Projects are allowed in the buffer zones from April 1 to October 31, Projects are not allowed in buffer zones in the winter when eagles are in the area.

Mountain Plover. Surveys were conducted for the mountain plover on potential habitat on FFO land between 1998 and 2000, and one adult with a chick was found during these surveys. Approximately 12,000 acres of designated potential mountain plover habitat have been identified on FFO land in the southern portion of the FFO area outside the area of intense oil and gas development. The designated potential habitat has been mapped and receives special management for the mountain plover. Proposed projects inside the designated potential habitat are subject to timing limitations that consist of no surface disturbance during the mountain plover nesting season from April 1 to July 31, or for projects that take place during the nesting season, biological surveys for the mountain plover would be required before the project would be authorized. If plovers were found near the proposed oil and gas well or the facility, site-specific constraints would be developed to ensure that the project would have no negative impacts on plovers. Projects that would create a permanent noise source with the potential to

affect a known plover nesting area would be subject to noise mitigation requirements.

Mexican Spotted Owl. Surveys for the Mexican spotted owl on FFO land began during the summer of 1992, in which all potential habitat on FFO land was evaluated and prioritized. These surveys followed the USFS survey protocol (USFS 1996), resulting in no spotted owls being detected. Potential habitat was surveyed again in 1993 and no spotted owls were detected. After 1993, the highest priority habitats on FFO land were surveyed periodically using nocturnal call counts and no spotted owls were detected. Mexican spotted owl critical habitat was designated on FFO land in March 2001 (USFWS 2001). No Mexican spotted owls were found during 2001 surveys. During surveys in 2002, one Mexican spotted owl was found late in the summer. After extensive follow-up surveys, no nest was found and no other owls were found. No spotted owl Protected Activity Centers (PAC) have been designated on FFO land.

The designated Mexican spotted owl critical habitat on FFO land was surveyed and analyzed during the summer of 2001 to establish Reference Conditions of the habitat as outlined in the Mexican Spotted Owl Recovery Plan (USFWS 1995). Three habitat types were established and mapped: 1) mixed conifer, 2) ponderosa pine, 3) piñon-juniper. Out of the 2,617 acres of critical habitat on FFO land, seven small stands of mixed conifer habitat were identified. These stands ranged from 2.3 to 33 acres and totaled 85.7 acres (3.3 percent of the critical habitat). Six stands of ponderosa pine covering 349.5 acres (13.4 percent of the critical habitat) were also identified. The remaining 2,182 acres of the critical habitat (83.4 percent of the total) was classified as piñon-juniper.

Oil and gas exploration and production have occurred on the designated Mexican spotted owl critical habitat since the late 1950s. All of the critical habitat has been leased for oil and gas exploration and held by production. There are currently 23 active wells and 5 abandoned well pads on the critical habitat.

The potential exists for more roads and more well pads to be built in the critical habitat under all alternatives. However, the 85.7 acres of mixed conifer habitat have not been impacted by oil and gas exploration due to the steep and rugged topography of the canyons that support the habitat.

Southwestern Willow Flycatcher.

Surveys for the southwestern willow flycatcher began on FFO land in 1993 and after 9 years of surveys, no breeding southwestern willow flycatchers have been detected on FFO land. There are no historic records of this species ever breeding on land administered by the FFO or on nearby lands. The greatest threat to this species is habitat loss. The FFO administers about 7 percent of the river frontage along the San Juan, Animas, and La Plata Rivers in the planning area. This land occurs in small widely scattered parcels surrounded by private lands, which are increasingly being developed for residential uses.

Implementation of the Farmington Southwestern Willow Flycatcher Habitat Management Plan (BLM 1998a) serves to protect FFO lands along the rivers and creates islands of habitat that may improve towards potential willow flycatcher habitat over time. It includes measures to protect potential habitat to ensure that there would be no net loss of potential southwestern willow flycatcher habitat from oil and gas development or other ground disturbance activities.

Other Special Status Species

Not all rare species receive the legal protection of the ESA of 1973, as amended. These species may not be rare enough to warrant protection under ESA, or there may not be sufficient data collected about the species for the USFWS to make a determination to list under ESA. Rare species or species with insufficient data are referred to as sensitive species. BLM policy, as outlined in the Guidance on Special Status Species Management (BLM 6840 Manual), is to manage sensitive species so that actions the BLM funds, authorizes, or carries out should

not contribute to species becoming listed under ESA. Lists of special status species are maintained by several agencies, including the USFWS, BLM, USFS, and the State of New Mexico. There are 34 special status species that may have the potential to occur in the planning area (Table 3-12). The FFO has coordinated with other agencies to determine which of these 34 species warrant special management or field studies to collect data.

Currently, the following species receive special management: beautiful gilia, also known as Aztec gilia (*Aliciella formosa*), Brack's fishhook cactus (*Sclerocactus cloveriae* var. *brackii*), American peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), ferruginous hawk (*Buteo regalis*), yellow-billed cuckoo (*Coccyzus americanus*), and western burrowing owl (*Athene cunicularia*). Potential bat habitat is surveyed before construction projects that would impact sandstone cliff faces are authorized. The FFO conducted 3 years of surveys to determine the potential abundance and management needs of the gray vireo. In the future, the FFO will cooperate with other agencies to gather data and develop special management for special status species when the situation warrants.

The BLM would continue to manage non-federally listed species, according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

Land Ownership Adjustments

Land ownership changes planned under Alternative A would not be expected to affect special status species. The FFO will retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

Under this alternative of continuing current management, OHV use would be restricted in SDAs that protect T&E species, such as the closed designations in The Hogback ACEC, in which Mesa Verde cactus and Mancos milkvetch are known to occur.

Specially Designated Areas

No modifications or additions to SDAs for special status species would occur under Alternative A. There are 5 areas specifically designated for the protection of special status species: The Hogback ACEC, Aztec Gilia ACEC, Bald Eagle ACEC, River Tracts SMA, and Reese Canyon RNA.

Coal Leasing Suitability Assessment

The development of land suitable for coal development under Alternative A has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Coal Belt SMA. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts SMA, would not be affected if coal mining were approved because they would be eliminated through the application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on **Map 4-1**. Many of the PRLAs and competitive lease tracts occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be

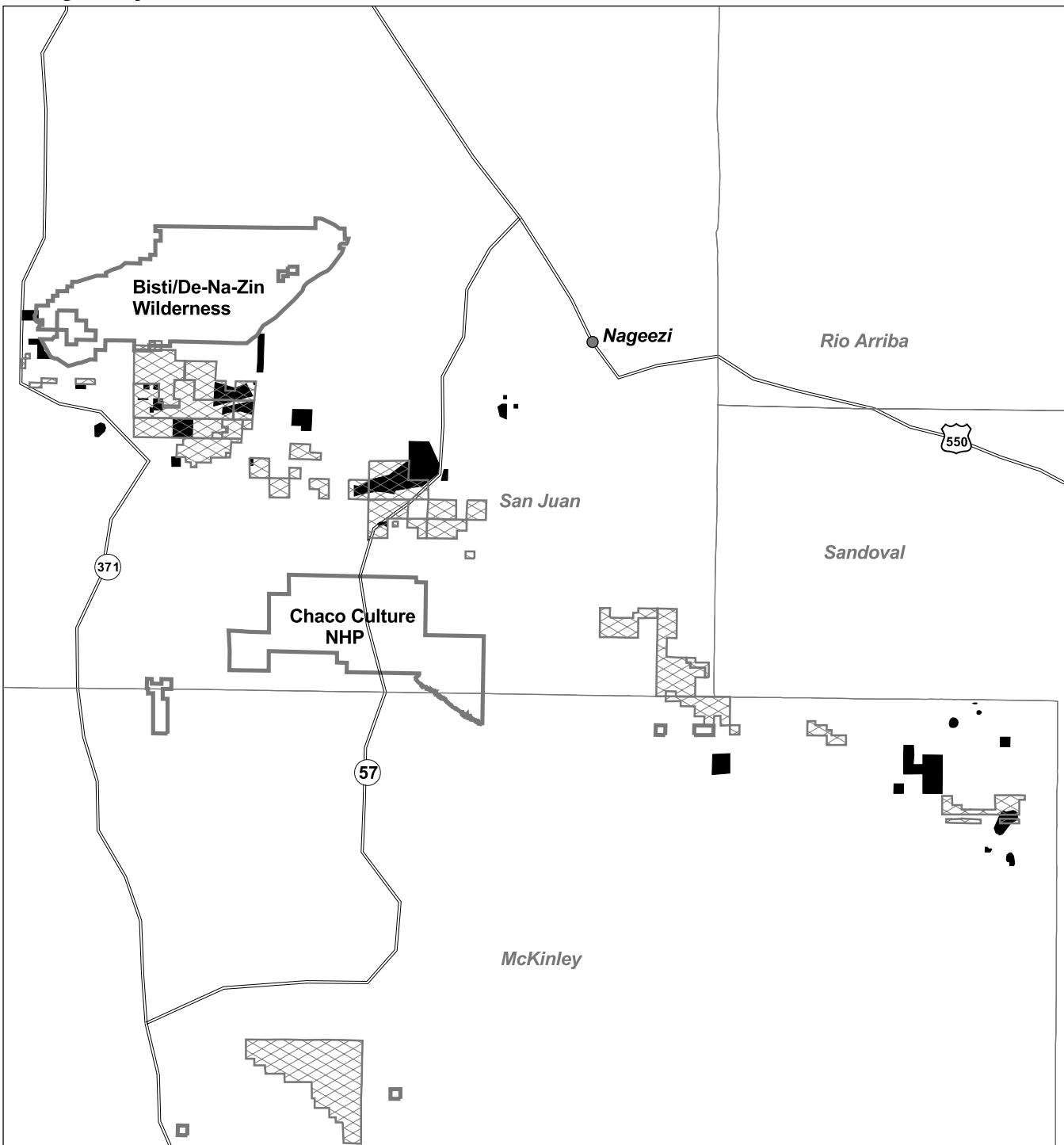
completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the ESA, so it is anticipated that mitigation measures would be required to minimize impacts.

Coal mining under Alternative A has the potential to impact non-federally listed or proposed sensitive species, but potential impacts would be assessed in a project-specific environmental document and the types of protective measures to be implemented would be determined at that time.

Fisheries and Wildlife

Information on fish and wildlife was obtained from biologists working for the federal agencies in the planning area. Quantitative data regarding the effects of oil and gas development and operations on wildlife was obtained from GIS analysis. Background information regarding the impacts of various activities associated with oil and gas development on wildlife was obtained from the pertinent literature and conversations with agency biologists.

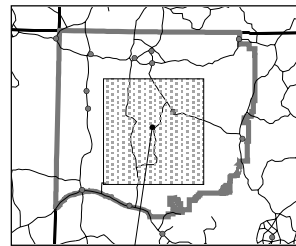
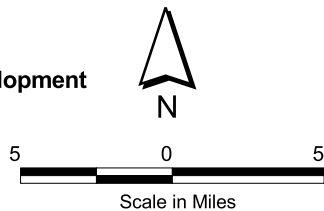
Activities associated with oil and gas development can affect wildlife and their habitat during exploration, development, operations, and abandonment (Bromley 1985). This analysis concentrates on the development and operational processes that occur from habitat alteration and the long-term presence of human activity. Oil and gas operations have the potential to impact wildlife through the direct loss of habitat and disturbance by human activity. Long-term habitat loss would occur from construction of permanent facilities such as well pads, roads, pipelines, and compressor stations. Even after parts of the well pads, roads, and pipelines are revegetated, the piñon-juniper and Great Basin Desert Scrub plant communities that comprise much of the potentially affected habitat would not be reestablished for many years.



-1055839005

LEGEND

- Mountain Plover Habitat
- Area of Coal Interest/Potential Development
- Town
- Major Road
- County Boundary
- State Highway



Area Shown

Source: Reeves 1998, 1999c, 2000

**Map 4-1: Potential Coal Mining Areas
in Mountain Plover Habitat**

The effects of oil and gas development activities on fisheries could involve physical or chemical changes to streams. A long-term study of PAHs associated with gas wells in the planning area has shown that these contaminants are not migrating off site and entering perennial or ephemeral drainages (Wirth 2001). Current and proposed oil and gas development and operation activities would continue to contribute to increased turbidity in perennial streams and ephemeral drainages. Given that the fisheries and other aquatic organisms in the rivers within the planning area evolved in highly turbid conditions, especially during high flow events, increased turbidity from oil and gas activities may not have a negative effect on them. For these reasons, it is believed that oil and gas well development and operations would not likely have an effect on fisheries and other aquatic resources.

Additional effects of oil and gas development on terrestrial flora and fauna can result from dust, noise, increased human activity due to greater road access, and habitat fragmentation. Although human activity would occur at the well pads and compressor stations on a regular basis, this analysis concentrates on the effects on roads because the road network is expected to be a larger contributor to the fragmentation of habitat within the planning area than the other facilities, and would generate potentially greater impacts from dust and human activity. This fragmentation was analyzed in terms of habitat loss due to road construction as well as in terms of the functional habitat loss that may occur along roads due to human activity.

It has been established that ecological effects of roads are generally negative (Forman 2000). Roads can prevent or hinder the movements of small species of wildlife such as amphibians, reptiles, and small mammals (Gibbs 1998, Trombulak and Frissell 2000). Studies of the effects of major highways on birds have shown reduced density for some species, due mainly to noise levels, not visibility of vehicles (Reijnen et al. 1995, 1996). Ferris (1979) determined that there were no

significant effects on breeding bird density attributable to an interstate highway in Maine, but he did find that some forest interior species were less common and some edge species were more common within 100 meters (328 feet) of the highway. For this analysis, it is assumed that the effects of roads and other facilities on song birds are much less than found in the above studies because the traffic volumes are much lower. Human activities along roads may disrupt nesting raptors such as the northern goshawk and golden eagle (Reynolds et al. 1992, Trombulak and Frissell 2000).

A summary of some of the literature shows that ungulates may be affected by roads depending on their distance from roads (Rost and Bailey 1979, Rowland et al. 2000, Dyer et al. 2001), road density (Lyon 1983, Unsworth et al. 1998, Millspaugh et al. 2000), vehicle use levels (Cole et al. 1997, Dyer et al. 2001), road distribution and management (Cole et al. 1997, Rowland et al. 2000), surrounding habitat and terrain (Unsworth et al. 1998, Rowland et al. 2000, Dyer et al. 2001), season (Millspaugh et al. 2000, Rowland et al. 2000), sex and age of animals (Unsworth et al. 1998), and hunter use (Cole et al. 1997, Millspaugh et al. 2000).

The avoidance of roads by large species of mammals has been documented to result in the functional loss of habitat and reduced carrying capacity (Dyer et al. 2001, Rowland et al. 2000). Such avoidance behavior has been observed for mountain lions (*Felis concolor*), mule deer, and elk (Dyer et al. 2001, Rost and Bailey 1979, Lyon 1983, Rowland et al. 2000, Van Dyke et al. 1986). Rost and Bailey (1979) found that deer and elk avoid roads particularly within 200 meters (656 feet) and Forman (2000) also assumed a 200-meter (656-foot) disturbance zone on each side of secondary roads. Hershey and Leege (1976) and Ward (1976) found reduced habitat use by elk within 0.25 mile (1,320 feet) of roads. There appears to be little information on the effects of roads on pronghorn antelopes, although Ward (1976) found that pronghorn antelope were apparently not affected by traffic along an interstate highway. Ungulates such as mule deer and elk

tend to avoid habitat along well-traveled highways to a greater extent than lighter traveled secondary roads (Ward 1976), and it is assumed the same holds true for pronghorn.

Analysis is concentrated on mule deer and elk because their habitat is already fragmented, and additional oil and gas development has the potential to negatively affect their habitat. The analysis also considers pronghorn antelope and other wildlife to a lesser degree.

Studies regarding ungulate avoidance of roads have not been conducted on land within the planning area, but given the widespread documentation of this phenomenon, it is assumed that mule deer and elk would avoid most open roads. Based on information in the literature, it was assumed that deer may avoid habitat within 660 feet of roads and elk within 1,320 feet of roads. These distances were used to determine the potential functional habitat loss along roads, which does not equate to the total abandonment of the habitat but to reduced use of the habitat. For example, elk use of habitat within 1,320 feet of an interstate highway was 20 percent of the habitat use farther away; along gravel secondary roads, it was about 44 percent of habitat use farther away (Ward 1976). In the analysis, the number of habitat fragments were also determined within 0.5 mile from roads because security cover of contiguous tracts of land over 250 acres in size and at least 0.5 mile from the nearest road may be important for elk during hunting season.

This analysis of impacts on wildlife under the alternatives concentrates on the land in the high development area on FFO land. The analysis also addresses oil and gas development on USFS, USBR, and AFO land, but to a lesser degree. Within the high development area, the focus of analysis is on the 397,000 acres of public land in the 13 Wildlife Areas proposed

under Alternatives C and D. The impacts within these areas are discussed under all alternatives to provide a means for comparison across alternatives. These areas are used because they encompass the major wildlife use areas and contain the 134,000 acres currently managed by the FFO, identified as Critical Big Game Habitat under Alternatives A and B (Table 2-5).

Oil and Gas Leasing and Development

There are currently an estimated 1,886 miles of roads within the boundaries of the wildlife areas that are the focus of analysis, 1,650 miles of which are on public land. In the 397,000 acres of public land in wildlife habitat, the road density averages approximately 2.6 miles per square mile (mi/mi²). There are an estimated 4,528 existing wells that, along with roads and pipelines, have resulted in the long-term loss of almost 19,000 acres of habitat, or 4.8 percent of the area (**Table 4-6**).

Functional habitat was calculated for public and non-public land in the 13 proposed Wildlife Areas because big game and other wildlife move freely between public and non-public land. The total area within the 13 Wildlife Areas is approximately 523,700 acres. Functional habitat loss in this area is estimated to be 238,400 acres (46 percent of total), when taking into account all areas within 660 feet of roads and 391,790 acres (75 percent) within 1,320 feet of roads (Table 4-6). In other words, an estimated 46 percent of the approximately 523,700 acres of wildlife habitat occurs within 660 feet of a road and 75 percent within 1,320 feet of a road. This land may be receiving less use by mule deer and elk, and perhaps by other species of wildlife, than areas further than 1,320 feet from roads.

Table 4-6. Estimated Functional Habitat Loss and Projected Levels of Disturbance on Public Land in the Proposed Wildlife Areas on FFO Land¹

Disturbance Category	Oil and Gas Facilities ²						Functional Habitat Loss ³			
	Roads		Wells ⁴		Total ⁵		660-foot Road Effects Zone		1,320-foot Road Effects Zone	
	Miles (mi/mi ²)	Acres Disturbed	Number	Acres Disturbed ⁴	Acres Disturbed ⁵	% of Total Area ⁶	Acres Affected	% of Total Area ⁷	Acres Affected	% of Total Area ⁷
Current Disturbance	1650 (2.6)	9,900 ⁸	4,528	9,056	18,956	4.8%	238,400	46%	391,790	75%
Projected Disturbance										
Alternative A	44 (0.1)	- ⁹	542	1,712	20,668	5.2%	245,440 ¹⁰	47%	405,870 ¹⁰	78%
Alternative B	296 (0.5)	-	3,653	11,546	30,502	7.7%	285,760 ¹⁰	55%	486,510 ¹⁰	93%
Alternative C	219 (0.4)	-	2,712	8,570	27,525	6.9%	273,600 ¹⁰	52%	462,190 ¹⁰	88%
Alternative D	220 (0.4)	-	2,712	8,570	27,525	6.9%	273,600 ¹⁰	52%	462,190 ¹⁰	88%

- Notes: (1) Proposed wildlife management areas would not be part of Alternatives A and B; only some would be part of Alternative D. The current and projected acreage disturbed in these areas is shown under each alternative for comparative purposes.
- (2) Includes oil and gas facilities only on public land.
- (3) Functional habitat loss indicates habitat in the area of roads that is potentially used to a lesser degree than habitat further away from roads. Functional habitat loss was assessed for zones of 660 and 1,320 feet on each side of the roads.
- (4) Current disturbance assumed 2 acres per existing well. Projected disturbance acreage calculated as described under Watersheds in Chapter 4.
- (5) Total equals land disturbed for new wells, roads, and pipelines, plus current land disturbance.
- (6) Total area equals 397,000 acres of public land within the 13 proposed wildlife areas.
- (7) Total area equals 523,700 acres of public and non-public land within the boundaries of the 13 proposed wildlife areas. Non-public as well as public land is included in the functional habitat loss analysis because big game and other wildlife move freely between public and non-public land.
- (8) Assumes 6 acres disturbed per mile of road using a 50 foot right-of-way.
- (9) Acreage of land disturbed for new roads for each alternative is included in the acres disturbed for new wells.
- (10) Acreage for alternatives = current functional habitat loss + estimated additional functional habitat loss estimated due to implementation of the alternatives. Likely an over-estimation of functional habitat loss because location of new roads is not known and some new roads would occur in areas already included in the existing functional habitat loss acreage.

Current habitat fragmentation by roads and three roads effects zones were calculated for all of the land within the 13 proposed Wildlife Areas (523,700 total acres) (Table 4-7). Habitat fragments were calculated for land at least 0.5 mile from the nearest roads because such habitat may be important to elk as escape cover during the hunting season (Millspaugh et al. 2000), and this also likely applies to mule deer.

Elk habitat should be a contiguous area of at least 250 acres at least 0.5 mile from the nearest road. The percentage of habitat fragments outside roads and the road effects zones ranges from 98 percent of the habitat in fragments created by roads alone to 4 percent of the habitat created by the 2,640-foot road effects zones (Table 4-7).

Table 4-7. Habitat Fragments Created by Roads and Road Effects Zones in Proposed Wildlife Areas on FFO Land¹

Fragment Categories	All Fragments			Fragments 250 Acres or More		
	Number	Average Size (acres)	% of Total Area ²	Number	Average Size (acres)	% of Total Area ²
Fragments created by roads alone	832	616	98%	186	2,585	92%
Fragments outside the 660-foot road effects zone	700	381	53%	198	1,226	46%
Fragments outside the 1,320-foot road effects zone	699	167	22%	105	845	17%
Fragments outside the 2,640-foot road effects zone	163	131	4%	25	635	3%

Notes: (1) Refers to 13 wildlife areas proposed for Alternative C.

(2) Total area equals approximately 523,700 acres of public and non-public land covered by 13 proposed wildlife areas on FFO land. Percent of total area refers to area of land covered by fragments created by roads alone and the percent of total area covered by habitat fragments outside the three different road effects zone categories.

Analysis of habitat fragments 250 acres or more shows a broad range in number, average size, and percent of habitat available outside the effects zones, depending on the fragment category considered. There are an estimated 25 habitat fragments of 250 acres or more totaling over 15,800 acres at least one-half mile from the nearest roads (Table 4-7), covering only 3 percent of the total area. Supporting information on the current amount of habitat disturbed, the projected amount of land disturbance, and habitat fragments for each of the proposed 13 Wildlife Areas appears in an unpublished technical report (SAIC 2002a) available at the FFO.

Current oil and gas development also may affect mule deer, elk, and other wildlife on USFS land. It is assumed that the impacts of oil and gas development and operations on these

wildlife are less than on FFO land because the road density on the USBR land (2.3 mi/mi²), Carson National Forest (CNF) (1.6 mi/mi²), Santa Fe National Forest (SFNF) (1.4 mi/mi²), and AFO land (2.0 mi/mi²) are much less than on FFO land. In addition, well density is less on these lands than on FFO land.

It is assumed that the amount of current habitat alteration and loss in the planning area have resulted in a reduction in habitat carrying capacity for mule deer, elk, and other wildlife, but the degree of this reduction is not known. The potential impacts on wildlife due to habitat fragmentation and direct habitat loss presented in this RMP/EIS are based on research completed mainly outside the Southwest. Assessments of local wildlife populations are planned by FFO staff through monitoring activities to determine actual effects in the field.

Monitoring activities are summarized toward the end of this chapter.

The estimated additional direct habitat loss due to projected oil and gas development under Alternative A (1,712 acres) (Table 4-6) would be likely to further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife. The level of this reduction cannot be quantified due to 1) incomplete data on mule deer and elk populations in the planning area, 2) variations in animal reactions to vehicle density, road density, and other factors, 3) the lack of site-specific data on the effects of roads on mule deer and elk, and 4) the lack of information on the exact location of new wells and roads. It is concluded that oil and gas development under this alternative would result in a slight reduction of the mule deer and elk populations in the planning area because it would add to habitat fragmentation.

Pronghorn antelope occur principally in the Ensenada Mesa area, covering 43,179 acres of public land with 255 miles of existing roads, a road density of 3.8 mi/mi², and 753 existing well pads. The amount of existing long-term habitat loss is estimated to be over 3,000 acres or 7 percent of the area. A total of 57 wells would be developed in this area under Alternative A, and long-term disturbance including roads and pipelines would affect about 180 acres or 0.4 percent of the total area. Implementation of Alternative A may result in negative impacts to the pronghorn antelope due to oil and gas development, but the degree of this impact cannot be quantified because of: 1) lack of information on the location of new roads and wells; 2) lack of site-specific data on the effects of roads on antelope; and 3) variations of animal response to vehicle density, road density, and other factors.

Other species of wildlife that would be affected by oil and gas development would be those found in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. Reptile and small mammal inventories have not taken place within the planning area, although some breeding and wintering bird surveys have been completed.

The distribution and abundance of bird species may be altered, depending upon the density of wells and roads, but quantifying this change would be difficult with current data. However, the FFO conducts point count surveys over 9 transect routes twice a year in piñon-juniper and Great Basin Desert Scrub habitat types to monitor changes in the numbers and distribution of bird species. Data from these surveys may be used to document future habitat disturbance and its impact on birds.

The impacts to avian species due to habitat fragmentation are somewhat variable as reported in the literature. Variables influencing this are the type of habitat affected, the magnitude of the disturbance, and the species of the birds involved. Much of the high-density natural gas development in the FFO occurs in the northeast part of the field office area where piñon-juniper are dominant. Paulin et al. (1999) found that “a landscape mosaic that intersperses cover patches with openings providing foraging and browsing opportunities may be the best way to meet an array of management objectives.” Successfully revegetating pipeline rights of ways and the edges of well locations may assist in accomplishing this mosaic. In addition, this interspersed potential foraging areas may help offset the long-term loss of nesting habitat and mast such as piñon-pine seeds and juniper berries.

Under Alternative A, new wells and roads would result in the long-term loss of an estimated 335 acres in the CNF, 6 acres on the SFNF, 70 acres on USBR land, and 500 acres on AFO land. Most of the land that would be disturbed by these activities is in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. This long-term loss would affect many of the same species as those assessed above for FFO land, including mule deer and elk. Pronghorn antelope do not occur or are uncommon in these areas. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance.

Land Ownership Adjustments

Over 328,000 acres of FFO land would be available for disposal, mostly south of US 550. This acreage is scattered without being concentrated in a particular wildlife habitat area, so the change in ownership is not expected to significantly affect wildlife habitat.

OHV Use

Approximately 1,230,000 acres of land would be open to OHV use on FFO land under Alternative A. OHV use can have negative effects on plant communities, and therefore negative effects on wildlife habitat. OHV use also occasionally results in direct wildlife mortality, harassment of wildlife, and wildlife abandonment of an area due to human intrusion. The degree of the effect of OHV use on wildlife on FFO land has not been determined, but since it is assumed that OHV use is greater close to the tri-cities area and decreases with distance from the cities, the greatest amount of use is in marginal wildlife habitat in the tri-cities area and less use occurs in habitat further away from the tri-cities area. There is potential to have negative effects on wildlife from open OHV designations in most of the FFO area.

Specially Designated Areas

There would be no additions or modifications to specially designated wildlife habitat areas under Alternative A. The Critical Big Game Habitat management areas would continue to be managed with timing limitations on oil and gas operations between December 1 and March 31 to protect turkeys, elk, and deer populations.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal mines have the potential to affect a large amount of land, most of which would not be near the major wildlife habitat areas. Proposed coal mines would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed at that time.

Wilderness

Wilderness values can be degraded when and if human activities (and the evidence thereof) impair pristine qualities and naturalness. Oil and gas infrastructure and operations and OHV use are expanding in the region and could intrude on natural qualities in protected areas.

Because of the restrictions and protection associated with wilderness designation, no direct impacts are anticipated to the Bisti/De-na-zin WA from any of the alternatives. Direct impacts would only occur if oil and gas development were allowed within the WA or any of the WSAs in the planning area. Only valid existing rights predating enactment of the Wilderness Act (for WAs) and FLPMA (for WSAs) could be developed, and these would be regulated to prevent unnecessary or undue degradation of wilderness qualities. Indirect impacts would occur if activities located outside WAs or WSAs caused conditions that would be noticeable and detrimental to wilderness qualities, such as noise, dust, modifications to surrounding landscape, or ecological changes to a larger area. Cumulative impacts could result from other actions in the region that, combined with actions on public lands, could impair wilderness values.

Oil and Gas Leasing and Development

Oil and gas development along the periphery of the Bisti/De-na-zin WA and the Ah-shi-sle-pah WSA could generate noise that indirectly affects natural quiet in some locations within the protected areas. Similarly, development outside these areas could affect viewsheds from locations within the protected areas. Most surrounding areas are VRM Class III and IV, where fewer visual management constraints would be imposed on new development.

The 5 WSAs within the planning area in the AFO are closed to oil and gas development and mineral entry. Any new development in the AFO area would be outside the WSAs and

could only have minor indirect effects on peripheral areas.

Land Ownership Adjustments and Specially Designated Areas

Several actions would increase the potential for the Ah-shi-sle-pah WSA to become recommended and ultimately designated as wilderness. These include possible de-selection of acreage within the WSA by Navajo tribe and adjudication of PRLAs (making coal development less likely), inventory of adjacent lands with wilderness suitability and acquisition of these lands, and a revised recommendation to favor wilderness designation. Designation of this WSA as wilderness would add 6,563 acres to the most protected land category within the FFO and ensure that wilderness qualities would be protected for future generations.

If the Ah-shi-sle-pah WSA is designated as wilderness, its 6,563 acres would be permanently withdrawn from mineral leasing. Any leases with valid existing rights would be managed under principles of nondegradation of wilderness values. This would result in added areas with a high degree of protection of natural resources and naturalness and provide more areas for primitive and remote recreational experiences.

Ongoing FFO actions to acquire inholdings (primarily state and tribal lands) will continue in the WA. The larger consolidated wilderness created in 1996 would augment the possibilities for remote experiences, create a more manageable land unit, and lessen the potential for indirect effects from activities on adjacent lands that are not under federal management.

OHV Use

There would be no change in OHV designations that currently close the WA and WSAs to OHV use.

Coal Leasing Suitability Assessment

There is some uncertainty about lands within the Ah-shi-sle-pah WSA that could be de-selected by The Navajo Nation or by adjudication of PRLAs for possible coal development. If adjudication favors the PRLAs,

mining of coal would be likely on a large part of the WSA, which would effectively degrade the natural qualities of this area. Indirect impacts from development on adjacent areas would be possible. Any future coal development of specific tracts of federal land would require further NEPA review prior to a decision. Development on adjacent areas may be regulated to minimize indirect impacts of nearby human activity.

Rangeland

Impacts to rangeland and livestock grazing would occur from any actions that would damage forage, modify land ownership and access to grazing allotments, or require major rangeland improvements in order to continue grazing. Grazing allotments cover most of the FFO area.

Oil and Gas Leasing and Development

Surface disturbance caused by oil and gas development would result in damage to vegetation used for forage and reduction of the acreage available for livestock grazing. Many issues have been raised by grazing permittees regarding poisoning or other physical damage to livestock near oil and gas wells, especially where the well pads are not fenced. Livestock may inhibit reestablishment of reseeded areas around new development by grazing new seedlings. Conflict resolution between competing land uses would continue to require mediation by the FFO under all alternatives. Surface disturbance from construction of oil and gas facilities, and the movement of trucks and other equipment from site to site, often accelerate the spread of noxious weeds that can poison livestock and compete with desired rangeland plants.

There would be fewer new well sites under this alternative, so the impacts from oil and gas activity on grazing would be the least of the four alternatives, but there would be a reduction in forage and an increase in the spread of weeds in the high development area.

Land Ownership Adjustments

Land disposal could change the grazing authorization in the FFO area. Most disposal areas would be transferred under R&PP Act regulations and grazing could be continued. Under Alternative A, most of the land identified for disposal would be located south of US 550, so the grazing allotments in this area would be the most likely to be affected by changes in land ownership.

OHV Use

Unlimited OHV access would continue to damage forage in most of the FFO area. This would lead to loss of topsoil, a reduction of soil quality, and a downward trend of forage in the most used OHV areas. Improving rangeland health to meet the BLM standards would be more difficult to achieve because cross-country travel could damage forage and spread weeds. Open OHV access would continue to generate conflicts between permittees and other land users. Unlimited access increases the opportunity for vandalism of range improvements, cut fences, and harassment of livestock.

Specially Designated Areas

Grazing limitations are identified under some of the SDAs within the FFO. Under Alternative A, there would be approximately 10,000 acres in 22 SDAs that would limit grazing. These management prescriptions are identified in Table 2-5 under the Grazing heading for each area listed under this alternative.

Coal Leasing Suitability Assessment

Additional coal mining, if approved, would remove more rangeland from forage production and would result in changes to the grazing authorization for the life of the mining operation. There would be the potential for land use conflicts between mining operations and grazing permittees that would require mediation by FFO staff.

Lands and Access

Scoping raised several issues associated with lands and access, focused primarily on potential impacts to private land. These are listed below:

- Noise, visual intrusions, dust, and traffic associated with oil and gas development and operations can be incompatible with residential and commercial uses.
- The proportion of land in federal ownership in the planning area constrains development, particularly in the growing tri-cities area.
- Oil and gas vehicles cause damage to county roads that serve residences and schools.
- New Mexico's policy on livestock control can cause conflicts between land users where private and public lands interface.
- Private property in split estate situations can lead to land use conflicts when owners are unaware of severed mineral rights.
- Trespass structures and uses occur on public land.
- Open access for motorized vehicles on public land can lessen the suitability of adjacent private lands for residential uses.
- The proliferation of oil and gas field roads is widely seen as a problem both in terms of the environmental and visual damage, and also in providing public access through and in proximity to private land.
- Increased oil and gas development could increase traffic and maintenance needs on the existing road network.

Direct impacts on lands result from physical restrictions and loss (or gain) of land for a specific use. Indirect impacts occur when activities permitted on public land create conflicts with uses on private lands. For

example, compressor noise at well sites, dust, and truck traffic related to oil and gas operations can be incompatible with residential uses. Cumulative impacts on land use in the region would result if activities and management of public land, in combination with other uses or foreseeable actions, could displace a valued use, interfere with planned development, or be detrimental to public welfare or safety.

Oil and Gas Leasing and Development

Access issues in the FFO are primarily associated with oil and gas activities. Concerns include the volume of industry-related traffic on oil and gas service roads, county roads, and state and federal highways; allocation of

maintenance responsibilities for roads used mostly by industry; and the proliferation of roads. Some roadways crossing federal land also cross on ROWs through private property. Occasionally, access can be limited when these roads are gated. Sometimes this occurs when ROWs expire and are not renegotiated with the landowner. Roads can also be closed to protect other resource values.

Table 4-8 shows the estimated change in vehicular activity from oil and gas field activities for each alternative. Alternatives are compared to a range of current and recent levels of oil field operations that generate between 17,300 and 21,000 average daily well site visits on federal land, and about 23,500 to 27,500 in the San Juan Basin (including non-federal land).

Table 4-8. Estimated Oil and Gas Well Site Visits by Alternative for 20-Year Planning Period

	Average Daily Trip Numbers			
	Alternative A ¹	Alternative B	Alternative C	Alternative D
Existing Wells				
Maintain wells (federal)	14,720	Same as Alternative A	Same as Alternative A	Same as Alternative A
Maintain wells (non-federal)	3,680			
Subtotal	18,400			
New Development				
Develop wells (federal)	130	400	300	300
Maintain new wells (federal)	2,440	7,330	5,430	5,490
Develop wells (non-federal)	140	140	140	140
Maintain new wells (non-federal)	2,550	2,550	2,550	2,550
Subtotal	5,260	10,420	8,420	8,480
Total Trips				
Wells on federal land	17,290	22,450	20,450	20,510
Wells on non-federal land	6,370	6,370	6,370	6,370
Total	23,660	28,820	26,820	26,880
Percent change from current levels (federal land) ²	-16%	+8%	-3%	-2%
Percent change from current levels (all lands) ²	-20%	+11%	-2%	-2%

Source: BLM 2000e.

Notes: (1) Based on trip number per function.

(2) Based on 21,000 visits on federal land and 27,500 visits to all well sites currently.

Well site visits account for development activity (including well, roads, and pipeline construction), annual maintenance on existing and projected new wells, and reductions from reclaimed wells. They also assume that well field activity occurs 365 days per year. Trips are based on the number of times a specific well site is a destination per year for certain maintenance functions or development activities. Maintenance may be performed on several wells in a day. While this is counted as several visits, it may in fact reflect one round trip with several “stops” along the way. These numbers are not the same as average traffic levels that are counted for discrete roadways by traffic counters, and therefore cannot be used to estimate additional traffic on a particular roadway. Table 4-8 shows that development on federal land accounts for about two-thirds of the estimated traffic volume from the oil and gas industry in the planning area currently. The trips cannot be attributed to specific roads, and are therefore most useful in estimating relative changes. There are no data on the level of traffic on oil and gas service roads and county roads. It is not known what portion of traffic on state and federal highways is attributable to industry use. It is generally known that county roads 2770, 4490, 4599, 7250 and 4990 are some of the most heavily used roads providing access into the oil and gas fields, and that the majority of the traffic on these roads is related to industry.

Impacts described below focus on overall change in traffic volumes in the planning area from oil and gas activities. The contribution of activities on federal land is provided as a percentage of overall changes.

Oil and gas development under this alternative would continue at the same level as current operations. Over the 20-year period of analysis, about 2,000 wells would be plugged and abandoned, and the sites reclaimed. With projected new development, about 8,130 acres would be disturbed and no longer available for a variety of surface uses. About 300 miles of new oil and gas service roads and 5,200 acres for new pipelines would generally be located

within existing ROWs. Where feasible, new major pipelines would be placed in existing utility, communication or highway corridors identified in the Western Regional Corridor Study (WUG 1992).

Over 20 years, about 9 large Phase I compressors (over 2,000 HP), about 133 new Phase II well compressors (500 to 2,000 HP), and 2,230 wellhead compressors (100 HP) would be installed at new sites on land with federal minerals and about 7,200 at existing well sites. These sites would be distributed throughout the high development area and could be located near communities and residences. Noise levels from some of these sites and smaller compressors at specific wells could be incompatible if located close to existing residences. As local noise ordinances are developed to address oil and gas issues, these would be enforceable on new permits within those jurisdictions. In the meantime, municipalities and BLM would continue to resolve noise conflicts on a case-by-case basis. The number of complaints and cases requiring resolution would be likely to increase as a result of the increased density of compressors, particularly near urban areas or communities. Temporary impacts could occur throughout the FFO from construction and development activities, such as noise, dust, and emissions from construction equipment and vehicles, but these would be localized and temporary in nature and have no long-term effect on any particular land use.

Currently, about 11 percent (744,500 acres) of the land within the FFO area has split mineral estate. There are just over 100,000 acres of private land within 3 miles of the tri-cities area incorporated boundaries, and about half this land has split estate. It is expected that the federal government would retain mineral rights to any lands disposed of by sale, exchange, or R&PP transfer. This could increase the amount of land in split estate in the FFO by about 264,800 acres (or 36 percent), increasing split estate from 11 to 15 percent within the FFO administrative area. This would continue to be an issue, particularly for private

lands near urban areas where future development options may be constrained by the potential for oil and gas development. Split estate complicates the oil and gas leasing process and therefore does not favor production. In urban areas, the surface land use controls of local jurisdictions would apply lease terms for oil and gas development on private land.

Where federal oil and gas minerals are developed on non-federal land (split estate areas), there is potential for incompatibility between existing or planned use of the surface real estate, and oil and gas operations with their noise, traffic, and visual appearance. BLM would continue to coordinate with surface owners on suitable conditions of approval on APDs. Local plans or zoning codes can influence the types of conditions that may be incorporated into drilling permits. These would generally provide for management of not only the subject property, but adjacent areas as well. On tribal land, the appropriate tribal office, BIA, and allotment holders, where applicable, would review applications. Issues of conflicting uses, loss of land for specific uses, or access concerns would be considered on a case-by-case basis. Adjustments in well locations, noise reducing measures, or other mitigations may be required to minimize conflicts with surrounding land uses.

Over the 20-year period of analysis, there may be a net increase of about 2 percent in the mileage of roads within the high development area of the FFO. This does not account for restoration or closure of roads as well sites are reclaimed. The projected number of daily trips for Alternative A would be the same or less than current levels from operations on federal land, based on typical fluctuating levels of activity over the last few years. No impact on service capacity of roadways would be caused by this alternative.

The new FFO Roads Committee and program is aimed at dividing fiscal and road maintenance responsibilities fairly between the BLM, counties, and the oil and gas industry. This is expected to improve some of the

maintenance problems that have occurred in the past and provide a better and more equitable division of resources. In the meantime, San Juan County will emphasize maintenance on county roads that serve residences and schools. The roads program would inventory the level and type of traffic on BLM roads and make needed improvements over time.

Land Ownership Adjustments

Land would be available for disposal or transfer south of US 550; however, fewer land adjustments are expected in the future. This is due to the depletion of desirable acquisition lands through a series of successful exchanges since 1988 RMP was completed. BLM land in the tri-cities area would still be available under R&PP Act applications. Disposals from the 1988 RMP would be carried forward (listed in Appendix F) and land south of US 550 would generally be available for exchange. All disposals would be reviewed for consistency with BLM and local plans and objectives. Disposal should provide a greater public benefit for appropriate use of land resources and may be implemented when the disposal does not conflict with resource protection and manageability of public lands. The BLM would generally maintain any existing valid mineral rights, increasing potential for split estate conditions. As such, development options on split estate lands may be constrained by the potential for future oil and gas development.

Acquisition of up to 127,782 acres of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands. Management prescriptions may limit use on some acquired lands (such as for grazing, future mineral access and leasing, or cross-country vehicular traffic). Under the FFO road program, BLM would retain any needed ROWs on disposal properties, therefore sales, exchanges, and transfers of land should not impact existing access. Acquisition of inholdings in SDAs would

generally improve continuity of access due to consolidated ownership.

OHV Use

Conflicts among OHV users, private property owners, and ranchers arising from unlimited cross-country vehicular access would continue under ongoing OHV policy. It is possible that some additional roadways would be closed to protect wildlife or other resources values as plans are developed for each OHV management unit.

Specially Designated Areas

BLM would attempt to acquire 127,782 acres of inholdings and any underlying non-federal mineral rights within the boundaries of SDAs. The acquired lands would be managed under the public land laws and any management prescriptions applicable to the contiguous public lands. Acquisition of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands.

Coal Leasing Suitability Assessment

Unsuitability criteria have already been applied to the PRLAs, Coal Belt SMA, and the 17 competitive lease tracts. Reapplication of the unsuitability criteria would be required for any future applications to lease land in the FFO for the purpose of coal mining. This process would eliminate the potential for incompatible mining activities in many areas that have special resource values or special protection, such as WAs, WSAs, cultural sites, special habitat. Buffer distances would be required between any future site and community and private land uses, such as schools, residences, cemeteries, and parks, that are considered incompatible or sensitive to coal mining. However, these minimal separations and the application of the unsuitability criteria would likely provide little attenuation of changes in visual context and character, noise, traffic, or dust to nearby locations from development of a new coal mine. Specific mine proposals would need to

be environmentally assessed to address site-specific compatibility issues in the approval process.

Applications for sites for collecting home fuel are reviewed on a case-by-case basis. This would limit potential for permitting sites that are incompatible with surrounding uses.

Visual Resources

The primary issue related to visual resources is the degree of visible change that may occur in characteristic landscapes, viewsheds, and areas with high scenic value. Project activities can introduce differing elements of form, line, color, and texture into the landscape. Direct impacts result from construction or placement of manmade features, such as roads, structures, equipment, or manipulation of vegetation. Indirect effects can result when actions change conditions that result in unsightly landscapes.

The degree of contrast and dominance of changes within the viewing area are the measure of change. Contrast also depends on viewing distance and the size of the features. Generally, the foreground refers to an area within a few yards to several hundred yards from the viewer, the middle-ground is several hundred yards to 5 miles from the viewer, and the background is generally beyond 5 miles from the viewer. In conjunction with the degree of contrast, the sensitivity or visual value of a location is considered when assessing overall impact to visual resources. Noticeable levels of visual modification in areas with lower visual value (VRM Classes III and IV) would produce less impact than the same degree of change in an area that has high visual value (VRM Classes I or II).

Several concerns were identified by BLM specialists and the community, particularly relative to the effects of energy development and OHV use on the visual quality of the surroundings. These are summarized below.

- It is generally perceived that the visibility of manmade features (roads, oil and gas wells, pipelines) in the

landscape has increased significantly in the last few decades.

- Many unauthorized roads are created when vehicles (both recreational and industry) take short cuts and drive around barriers. These tracks are then used repeatedly until the path becomes an unofficial road. This adds to the proliferation of roads and their visual impact.
- Visual scarring from OHV use is increasing, particularly around urban areas that are more accessible.
- Heavy trucks and vehicles operate on low-grade roads after rains and snow, and create large ruts that become gullies, widen the width of the original road, and create unsightly ground disturbance in the natural landscape.
- Well pad size and density contribute to a high degree of modification to the natural landscape. Well sites are located in prominent and visible locations, rather than sited to minimize their visibility from more traveled roadways and recreation spots.
- Follow-up and monitoring of reclamation activities (such as reseeding) is inconsistent, so these management prescriptions do not produce the intended natural restoration.
- Unreclaimed sites and discarded equipment add to the preponderance of manmade intrusions in the landscape.

Under all of the alternatives, construction of new well pads, pipelines and road segments, and associated clearing of vegetation have the greatest potential to alter visual conditions. Other major components associated with oil and gas development include water disposal well facilities, on-site water storage tanks, overhead powerlines, and compressor stations.

Well pads and facilities are visually dominant in the foreground and greatly alter the immediate environs. Several conditions influence the visibility of new and existing

elements, such as vegetative cover (type and density), terrain and line-of-site, and presence of other elements with visual dominance in the viewing area. When vegetative cover is low, new well pads and equipment would produce a moderate degree of contrast and change in the foreground. When vegetative cover is moderate to dense, clearing for new pads would introduce a high degree of change in the foreground and moderate change on middle-ground views. Most oil and gas facilities and related infrastructure have relatively little visibility in distant landscape views and therefore have little impact from afar except where vegetation is dense or line-of-sight is uninterrupted.

Very little exploratory work is expected in the planning area because the mineral resource is well defined. Activities during construction generate short-term visual impacts such as dust, truck traffic, night time site lighting, and placement of heavy equipment. Longer term visual impacts result from clearing vegetation from about 5 acres for new well pads, pipelines, and road segments. (Part of this area is reseeded after initial construction.) The contrast created by vegetation removal depends on the type and density of the cover. Longer-term visual scars can also be created from some sites that require a large amount of cutting and filling that contrasts with surrounding landforms. Structural contrast is largely related to the distance from which components are observed. Under STCs, measures are taken to minimize visibility, such as aligning new road and pipeline with land contours, and painting equipment to blend with natural color tones. In general, during the production phase, well pad facilities become subordinate to the landscape in middle-ground view (between 0.25 and 1 mile) and noticeable but not dominant to a casual observer in background views (1 to 5 miles) (BLM 2000e). Other larger facilities, like major new pipeline corridors, longer road segments, compressor stations, or resource storage centers, may be visible in distant views.

During the abandonment phase, equipment is removed and disturbed surfaces are

reclaimed with appropriate seed mixes. When sites are successfully restored to a natural condition, long-term improvement to the characteristic landscape results. Under each alternative, a projected level of reclamation would offset the impacts of new development. The net change is considered for each alternative below.

Because locations of specific well sites are not known, and impacts are most apparent in localized settings, the impact evaluations in this Proposed RMP/Final EIS are based generally on the projected percentage increase of oil and gas features in the landscape during the 20-year period of analysis. The potential for project activities to affect VRM Class I and II areas is noted within the FFO area. Because no new wells are projected within SDAs in the AFO, little or no impacts are expected to sensitive visual resources in the AFO area. Within the USFS land, there is strong precedent for enforcing visual management objectives. This is expected to continue and to minimize impacts on sensitive locations within the Jicarilla and Cuba Ranger Districts.

Within the planning area, the use of vehicles off roadways is another activity that causes visual changes. OHV activity can create pathways of disturbed vegetation, which form noticeable linear elements, and can also contribute to soil erosion and subsequent

change or loss of vegetation. This kind of damaging activity appears unsightly to many viewers because of the associated environmental degradation. This disturbance can be highly visible in areas where vegetation is removed, or in unvegetated landscapes where tracks can be highly noticeable. However, in some situations, dense vegetation can also hide (absorb) some of disturbance and make it less visible. OHV use has the most impact in the foreground and almost no visible impact in distance views. Generally, there needs to a high level of activity to result in “scarring” of the landscape. Such areas are mostly reported in the vicinity of the tri-cities area most accessible to greater numbers of recreationists. Some OHV travel is also reported around well pads, where heavy trucks can cause serious disturbance, particularly during wet weather.

Visual resources would continue to be managed according to prescriptions for specific SDAs; otherwise, VRM Class III and IV objectives would generally apply. **Table 4-9** lists the acreage in each VRM class under each alternative. Acreage includes both federal and non-federal lands, although VRM objectives would only apply directly to BLM land. Also, BLM would consider VRM classification of contiguous areas in defining COAs on APDs for federal minerals on non-federal land.

Table 4-9. VRM Classes of FFO Lands under Each Alternative

VRM Class	Acres ^{1, 2}			
	Alternative A	Alternative B	Alternative C	Alternative D
VRM I	71,948	100,600	135,106	83,433
VRM II	399,466	409,960	590,479	560,143
VRM III	1,013,099	1,020,084	1,123,830	1,104,717
VRM IV	2,587,591	2,541,460	2,222,689	2,323,810
Total³	4,072,104	4,072,104	4,072,104	4,072,104

Sources: BLM FFO, SAIC GIS data.

- Notes:
- (1) SDAs with more than one VRM class were counted as the most restrictive class. Therefore, acres may overestimate the amount of land in Classes I and II.
 - (2) Includes federal and non-federal land in the FFO.
 - (3) Totals may not add up due to rounding.

Oil and Gas Leasing and Development

The existing landscape in the high development area is interspersed with 18,000 wells and associated infrastructure, of which about 14,400 wells are on federal minerals, and about 12,240 within the FFO area. The high oil and gas development area covers about 7,000 square miles with an average density of almost 2.6 wells per square mile. The average road density in these areas is about 2 miles of roadway per square mile. By all accounts, development has become more noticeable over time as the number of wells has increased.

Under this alternative, 4,421 new wells (almost 2,300 new well sites) are projected on land with federal minerals and about 300 miles of new roadway. This represents approximately a 2 percent increase in new roads and road density. After subtracting the 2,000 wells that would be reclaimed, the well density would increase very slightly (less than 1 percent) from the current 2.6 wells per square mile. Restoration of unproductive well sites to a natural condition is estimated to improve some areas. Little net change in the quality of the visual landscape is expected.

Within the high development area, the projected number of oil and gas wells would represent a slight increase to the existing operations. This infill development would produce minor change in the degree of manmade modification over time, with minimal degrading of visual quality. If VRM objectives can be met, no adverse visual impact would result. Mitigations can be used to lessen impacts, such as siting wells away from canyon rims, using locations that are largely hidden by intervening landscape from most viewing locations, installing low profile tanks, and painting well pad equipment to blend with surroundings. In some circumstances, it is likely that VRM I objectives cannot be achieved, and impacts would result. The level of change may be acceptably low for one new well site, but each new site in VRM I areas would need to be

evaluated on a case-by-case basis to account for other features in the area.

Land Ownership Adjustments

No additional lands are identified for disposal under this alternative. Impacts to visual resources can occur if future development of disposed land causes visual changes that are incompatible with adjacent management objectives of BLM lands. Acquisition of inholdings within SDAs could add higher protection of visual qualities through the application of VRM designations in some areas.

OHV Use

OHV use would continue to contribute to localized alterations, mostly around the tri-cities area, further degrading areas with deteriorated visual value. Under this alternative, no change in VRM objectives is proposed and no actions would be undertaken to preserve these areas from further alteration. This would result in further decline in the visual quality of some locations around the tri-cities area. These would be noticeable from some roadways within the foreground and middle-ground viewing distance.

Specially Designated Areas

No changes in VRM prescriptions are identified under this alternative. As indicated in Table 4-9, about 88.7 percent of the FFO would be managed for VRM Classes III and IV standards and about 11.3 percent for VRM Classes I and II.

Coal Leasing Suitability Assessment

No new coal mines are currently proposed, but based on projections, new locations are likely to be developed over the next 20 years to replace projected declines at some mines in the San Juan Basin. Development is most likely to occur in the coal-rich belt extending from La Ventana on US 550, to Bisti on Highway 371 to Blanco Trading Post on US 550. Only areas that are identified as suitable (after applying the unsuitability criteria listed in Appendix C) would be considered. This area includes a high concentration of land with high visual and

cultural resource value that is managed to preserve scenic quality. Development of a new surface coal mining operation would cause substantial changes to the visual environment in the immediate surrounding area. Surface disturbance within the Ah-shi-sle-pah WSA could have significant adverse impacts on visual quality of this area with exceptional scenic and wilderness value. Although areas outside Bisti/De-na-zin WA are not classified as VRM I, potential impacts of future coal mines to viewsheds that contribute to outstanding qualities of the WA would need to be evaluated. Visual context and viewsheds of several cultural sites, including Chacoan Roads, Pierre's Site ACEC, Chaco Culture Archaeological Protection sites, Chaco Culture National Historic Park, and Traditional Cultural Properties would potentially be affected, and require assessment through further NEPA analysis that would be required for such an action in the future.

The impact on the landscape could be significant in localized areas around the mines. Depending on aspect, relation of highways to the new mining operations, and intervening terrain and vegetation, these alterations may affect a wider viewshed or expose a large number of viewers to highly degraded visual conditions. These issues would be further evaluated in a NEPA process prior to permitting of new coal mining. Approvals would need to consider sensitive visual resources in the permitting and review process, and mitigations would need to be developed for specific proposals to address any potential impacts on sensitive visual resources.

Overall, little change to visual conditions would result from oil and gas development under Alternative A. Some deterioration would continue from cross-country OHV use, particularly on easily accessible public lands in the tri-cities area, and major localized modifications could result from developing a new surface coal mine.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed. Direct impacts to cultural resources would be caused by surface disturbance during construction and by driving over sites with OHVs. New construction has the potential to intersect and adversely affect archaeological sites and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance.

Indirect impacts to cultural resources would be related primarily to new road construction. The presence of new roads in areas previously inaccessible to vehicular traffic is likely to be accompanied by accelerated vandalism of archaeological sites situated near these new roads (Nickens et al. 1981).

Estimates of critical "distance from roads" at which archaeological sites are likely to be vandalized vary widely. Studies from Colorado suggest that sites within 402 meters (1,319 feet) of roads are likely to be vandalized (Nickens et al. 1981), while studies from Utah indicate that sites within 741 meters (2,431 feet) of roads are most likely to be vandalized (Honeycutt and Fetterman 1985). Studies from Arizona indicate that sites within 600 meters (1,969 feet) of a road are likely to be vandalized (Ahlstrom et al. 1992). Considered together, prior studies indicate that archaeological sites within 400 to 800 meters (1,312 to 2,625 feet) of new roads would be subject to increased vandalism.

Due to mitigation measures required under continuing management regulations and policies, indirect impacts from vandalism resulting from the construction of new roads would be more likely to adversely affect cultural resources than direct impacts from new construction. The magnitude of impacts, both direct and indirect, would vary substantially among watersheds, depending on the number of wells to be constructed and the archaeological site density.

Archaeological site numbers and density vary considerably from one watershed to another. Site numbers and density were projected from the recorded site data in NM ARMS (2001). The estimated amount of new lands subject to initial surface disturbance varies from a low of almost 14,000 acres under Alternative A to almost 42,000 acres under Alternative B (Table 4-2). The number of archaeological sites likely to be affected in each watershed under each alternative was estimated using a weighted average of site densities for each watershed. The resulting weighted

average site density in each watershed was then multiplied by the number of acres projected to be affected by each alternative. **Table 4-10** lists the number of archaeological sites potentially affected in the 19 watersheds under each alternative. These data should be used to interpret the relative effect of oil and gas development across watersheds, and from one alternative to another. The actual impacts on archaeological sites cannot be determined until site-specific locations of wells, roads, and pipelines are known.

Table 4-10. Projected Archaeological Sites Affected by Oil and Gas Activities by Watershed

Watershed	Alternative A	Alternative B	Alternative C	Alternative D
Animas	129	386	289	289
Arroyo Chico	0	0	0	0
Blanco	47	141	106	124
Carrizo	78	234	176	207
Chaco Wash	10	31	23	27
Chinle	0	0	0	0
Gobernador	41	123	92	108
Kutz Canyon	10	30	23	27
La Plata	60	178	134	157
Largo	128	384	288	338
Mancos	0	0	0	0
Middle San Juan	22	67	50	59
Navajo Reservoir	88	271	203	238
Pump Canyon	25	75	56	66
Rio Chama	1	0	0	0
Rio Puerco	0	0	0	0
Rio San Jose	0	0	0	0
Upper Puerco	0	0	0	0
Upper San Juan	97	291	218	256
Total	736	2,211	1,658	1,896

Source: NM ARMS 2001.

Oil and Gas Leasing and Development

This alternative would have the least effect on cultural resources, with 736 archaeological sites projected to be within the areas of disturbance. In decreasing order of impact, recorded archaeological sites in the Animas, Largo, Upper San Juan, Carrizo, and La Plata watersheds would be most affected by this alternative (Table 4-10). In watersheds where the percentage of archaeological surveys is low, affected site quantity estimates may be underestimated.

The 358 miles of new roads (Table 4-3) constructed to serve oil and gas operations would provide greater public access to archaeological sites and TCPs in the high development area. A potential impact from oil and gas development would be increased vandalism of archaeological sites and TCPs due to construction of new roads.

Land Ownership Adjustments

The acquisition of non-federal land is proposed within 84 SDAs in the FFO that are designated to protect cultural resources. If these parcels are acquired, additional protection to significant sites would result.

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted.

OHV Use

Because OHV access would be open in most of the FFO area under this alternative, there would be a high potential for archaeological sites, especially those that are unrecorded or unprotected by closed and limited OHV designations within SDAs, to be damaged by vehicles driving across the landscape.

Specially Designated Areas

Special protection from such surface disturbing uses as oil and gas activities, mineral entry, land disposal, vegetative disturbance, and OHV access would be provided to important cultural sites in 84 SDAs within

approximately 40,400 acres in the FFO area. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

Site-specific cultural resources surveys and tribal consultation would be required before applications to mine coal for commercial or home fuel use would be approved. Any sites identified during these surveys would require avoidance or mitigation before mining could begin. Application of the unsuitability criteria would reduce the chance for impacts to sites eligible for the National Historic Register. Cultural resources protected in the SDAs would not permit coal mining.

Paleontology

Impacts to paleontological resources would be measured by physical damage to fossil-bearing formations through excavation or surface disturbance.

Oil and Gas Leasing and Development

Alternative A would involve the least acreage of surface disturbance and have the least potential for impacts to paleontological resources due to the lower projected well numbers and the current management prescriptions within the 4 SDAs.

Land Ownership Adjustments

There would be no impact on known paleontological resources because the resources would be surveyed prior to land transfers and important resources would be eliminated from disposal parcels.

OHV Use

Cross-country travel has been documented by BLM staff to have damaged some geologic and paleontological resources. Repeated rock climbing and damage to slopes, soils, and

vegetation could result in damage to paleontological formations through directly wearing down rock formations or causing accelerated erosion under Alternative A due to its open designation in most of the FFO.

Specially Designated Areas

There would be no changes to the management prescriptions and boundaries of any of the SDAs specifically intended to protect paleontological resources under Alternative A. Not designating additional areas could adversely affect some paleontological resources by not providing protection of important formations known to occur outside existing SDAs.

Coal Leasing Suitability Assessment

Coal mining would have the potential to affect these resources but, without site-specific information on the location of possible new mines, no impacts can be addressed. An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context.

Recreation

The primary concern for recreational resources is the potential for displacing or significantly altering existing recreational opportunities. These changes could come about through land requirements and operations associated with fluid and non-fluid mineral development, changes in OHV use, and land adjustments.

Direct impacts would result if recreational areas and uses are displaced or excluded due to other activities. Indirect impacts would occur when other actions affect the visual quality, noise environment, cultural resources, or health of vegetation and wildlife that contribute to recreational experience.

The local community and BLM resource specialists have identified several issues related to recreation, listed below:

- Increased population and popularity of the area for outdoor recreation is placing new demands on recreational opportunities for a range of activities.
- Access brings people seeking different kinds of experiences into direct contact, often interfering with differing recreational objectives. For example, motorized vehicles can cause noise that interferes with hunting, hiking, and back country camping. Motorized vehicles cause widening and damage to trails that is detrimental and unsafe for mountain bikers and horse riding. There are disagreements among different recreational users about the need for segregating trails for particular uses.
- Noise from oil and gas compressors is affecting the quiet environments that are desirable in many dispersed recreational activities.
- Noise from OHVs and other motorized recreational vehicles is disturbing other recreationists and residents adjacent to popular OHV sites.
- Some people feel strongly that the public lands are extensive, there is ample room for everyone, and therefore the land should be widely accessible for all uses.
- BLM provides very little surveillance and on-site monitoring at recreation sites, and vandalism, particularly at popular recreation sites close to the tri-cities area, is increasing and difficult to manage. Common acts of vandalism include destruction of oil and gas equipment, theft or destruction of signs, graffiti, and littering.
- Road closures impede access for hunting and other recreational use. On the other hand, some OHV users are ignoring barriers and entering areas that

- are private or closed for resource protection purposes.
- Shooting is allowed in some areas but can be unsafe and unnerving for other recreationists, and can occur in areas that are not designated for this activity. Safety is becoming a greater concern as the numbers of people and mix of recreation activities increase.
- Livestock are sometimes harassed by motorized recreationists.
- OHV use is causing visual scarring of some sensitive landscapes.

- Because of the current open OHV designation for most of the FFO area, some users assume that all areas are open to OHVs. People are unsure where restrictions apply.

Table 4-11 summarizes existing and projected oil and gas activity in the recreation areas under each alternative.

Table 4-12 indicates the number of acres that would fall within ROS classes under each alternative.

Table 4-13 presents recreational SMAs under each alternative.

Table 4-11. Oil and Gas Activity in Recreation Areas in the FFO Area under Each Alternative

Recreation Area Condition	Alternative A	Alternative B	Alternative C	Alternative D
Existing wells in Recreation Areas	430	409	561	561
New wells in Recreation Areas	176	427	360	360
Acres in Recreation Areas ¹	52,804	51,881	75,174	75,174
Well density change (percent)	41%	105%	63%	63%
Area displaced in Recreation Areas (percent) ²	<1%	2.4%	1.4%	1.4%

Notes: (1) Applies to BLM land only.

(2) Not accounting for wells that go out of production.

Table 4-12. ROS Classifications in the FFO Area under Each Alternative

ROS Class	Acres ¹			
	Alternative A	Alternative B	Alternative C	Alternative D
Rural	0	19,388	27,502	19,388
Roaded Natural	8,946	15,452	39,435	39,431
Semi-primitive non-motorized/motorized ²	5,275	6,636	5,275	5,275
Semi-primitive non-motorized	49,462	54,617	55,978	55,978
Primitive	0	0	0	0
Total	63,683	96,093	128,190	120,072

Notes: (1) Applies to BLM land only.

(2) Motorized uses generally apply to mesa top areas. Canyon sides and bottoms would be non-motorized.

Table 4-13. Areas Managed for Recreational Values in the FFO Area under Each Alternative

In Recreation Areas	Acres ¹			
	Alternative A	Alternative B	Alternative C	Alternative D
Acres managed for recreation	52,804	51,881	75,174	75,174
Percent change in Recreation Area	N/A	-1.7%	+42.4%	+42.4%
Percent of FFO ^{1, 2}	3.7%	3.7%	5.3%	5.3%

Notes: (1) Applies to BLM land only.

(2) Not accounting for future land adjustments.

Under this alternative, several of the ongoing issues and conflicts in managing recreational resources would continue. In addition, there could be an increase in the number of oil and gas facilities dispersed throughout the high development area over the next 20 years that could directly and indirectly affect recreation.

Oil and Gas Leasing and Development

About 4,421 new oil and gas wells could be developed on federal land in the FFO in the next 20 years, and about 2,390 on new sites. Accounting for newly disturbed and restored areas, a small amount of land in the high development area (about 900 acres) would become unavailable for multiple use. This should have little effect on the availability of dispersed recreation throughout the FFO area. Potential changes in visual quality, road density, noise levels, and overall human activity would be insignificant.

Current constraints on oil and gas development and the extent of areas specially managed for recreational values (about 53,000 acres, or 3.7 percent of FFO land) would remain in effect. There are currently about 430 wells within the 8 SMAs managed for recreational values, with about 396 new wells projected over the next 20 years. The average well density in these areas could increase by about 40 percent. This does not account for wells that may be reclaimed because it is not known where these would be located. Recreation would be displaced by new well facilities on less than 1 percent of these areas.

About half the new wells would have small compressors that generate noise. Under this alternative, there may be 300 new noise sources in recreation areas throughout the FFO. About 133 large compressors (between 500 and 10,000 HP) and up to 9,710 small compressors (100 HP) scattered throughout federal land in the oil and gas fields would also generate noise at new sites. Overall, this would cause localized changes in the noise environment throughout the FFO area near compressors. This could have widespread effects on the quality of dispersed recreation. Because of existing stipulations and protective laws, the WA and WSAs would be relatively unaffected by oil and gas operations, and noise from motorized vehicle use. Along the periphery of these areas, there may be indirect effects from noise sources on adjacent lands.

There would be about 440 new wells on AFO land under Alternative A. None are projected within WSAs or SMAs where recreation would be an emphasized value because these areas are generally outside the highly productive oil and gas fields. Consequently, minimal impact is expected to recreation in the AFO area.

Under Alternative A, the areas immediately around Navajo Lake and along the San Juan River would continue to be restricted by NSO constraints, with CSU stipulations for oil and gas development applying elsewhere on USBR land. Over the next 20 years, there could be 110 projected new wells on USBR land. Assuming some reclamation, there should be no net loss or gain of land for multiple uses.

Controlled surface use stipulations and VRM II classification allow for more careful siting of new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. A small number of new noise sources should have minimal overall impact, which could be lessened through site modifications. New wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas.

About 230 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District, and about half may have small compressors. New development would increase traffic on some forest roads and introduce new noise sources where people undertake dispersed recreational activities throughout the District. APDs would include actions to minimize impacts on visual objectives and consider siting relative to designated recreation areas. This would tend to lessen some impacts on recreation in USFS areas. It is unlikely that fewer people would recreate in these areas, but they would be likely to choose locations, when possible, away from intrusive manmade features. Clearing land can be more obvious in woodland areas, but forest and relief provide some screening of oil and gas facilities. Winter closure to exploration and well development would continue to prevent undesirable conditions for wildlife and recreationists from November to April, particularly hunters. The public would be able to purchase the trees cleared for new oil and gas roads, but the new roads would be gated and not provide general access to the public. Continuing to review new well sites carefully and requiring clearance for resources of concern (including recreation sites) would lessen the potential for direct impacts on developed recreation.

Overall, changes in visitation levels at developed recreation sites are difficult to predict, but visitor satisfaction would be likely to decline if scenic and acoustic quality declines as a result of oil and gas development. Under this alternative, little overall change in visitor

satisfaction is expected as a result of low numbers of projected oil and gas development.

Land Ownership Adjustments

Under Alternative A, land disposal would be emphasized, particularly as exchanges with other federal or state entities. If BLM disposed of land in the tri-cities area that is popular for recreation activities (for example, biking areas along the rim of Crouch Mesa), and it was developed for some other use, this loss of resource would be detrimental. To avoid this, applications under the R&PP Act would continue to be reviewed and evaluated for consistency with BLM policy. Actions to dispose of BLM lands that could affect special recreation areas or other areas that have become popular for unofficial OHV travel and mountain biking use would be favored if they incorporate these uses in a publicly beneficial manner after disposal. Areas south of US 550 that are available for transfer or exchange tend to have fewer special values for recreation, although some dispersed activities occur throughout the FFO. Disposal of these areas would have little impact on recreation. Acquisition of inholdings in recreation SMAs would improve management and access for recreation.

OHV Use

Under this alternative, the majority of BLM land in the FFO area would remain open to off-road use. Some users who enjoy unconstrained access see this as beneficial. However, the potentially incompatible mix of motorized and un-motorized uses would continue in open areas. Also, the potential for noise and dust from widespread cross-country travel to affect private landowners would continue. With population increases and the burgeoning reputation of this area for vehicular recreation, over the next 20 years there would likely be more off-road activity, particularly near urbanized areas. Indirect effects could reduce the quality of hunting opportunities and the natural qualities that are a component of outdoor recreationists' enjoyment.

Management plans for OHV use would be pursued in 13 areas identified in the 1996 OHV amendment. The assumption is that these areas would be classified as “limited” to maintained roads and designated trails, and this expectation has been accounted for under continuing management guidance. Much of the land in these areas is popular for hunting and outdoor recreation. Given the extensive network of maintained roads throughout the FFO and particularly the oil and gas areas, access should remain high. Some road closures for protecting specific resources have limited motorized access to favored hunting areas and could continue in the future. Even if all 13 OHV management units limited motorized access, over 60 percent of the FFO area would be open to cross-country travel.

Specially Designated Areas

There would be no change in SDAs or their prescriptions under this alternative. ROS classifications (Table 4-12) would remain the same. An updated inventory of roads in the FFO is needed in order to apply the ROS as a management tool to improve the recreational experience.

Coal Leasing Suitability Assessment

No additional (new) development of coal resources has been specifically located under this alternative within the FFO. The area with the highest potential for coal mining has no specially designated recreation areas. Development would not be permitted in the WA where the recreational experience has special value. There would be no development in the WSA until a Congressional decision is made and/or the PRLAs adjudicated. If adjudication favors the PRLAs, development of coal mines in the WSA would have localized impacts on land that has high intrinsic value for remote recreation opportunities. The value of some special cultural sites and fossil deposits in the area that are popular for public visitation could be affected indirectly if a new surface mine were developed nearby (see Visual Resources).

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. According to the RFDS (Engler et al. 2001), small compressors of approximately 100 HP are expected to increase to be associated with approximately half the number of new and existing wells in the planning area. With a projected 4,421 new wells projected under Alternative A, and 14,400 existing wells on federal minerals, this could result in 9,410 small compressors scattered throughout the high development area on land with federal minerals. Noise from the small wellhead compressors caused by mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 9 large compressors (2000 to 10,000 HP) and 133 mid-size compressors (500 to 2,000 HP) would be installed under Alternative A. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA to a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor stations and well pads. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be mitigated on a case-by-case basis.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

OHV Use

Noise from OHV use would be most prevalent in the FFO area under Alternative A because access would have the fewest restrictions. OHV noise would be short-term, however, with insignificant long-term impacts.

Social and Economic Conditions

The primary socioeconomic issues associated with implementing the alternatives arise from potential changes in jobs and income, spending in the local economy, and changes in revenues in the form of royalties and taxes and disbursements to local governments. The following analysis focuses on development of oil and gas resources on federal lands as the primary action that could effect measurable change in the above categories. Of concern to the oil and gas industry, in terms of viability, is balancing production costs with value of the product.

Direct effects include changes in employment and income for oil and gas workers, expenditures in the local and regional economy for constructing new wells and infrastructure, changes in productive value and production payments (such as royalties), and changes in taxes and disbursements to state and local government. The estimation of direct expenditures for new well construction provides a comparison of the relative cost of alternate drilling technologies for each alternative.

Indirect effects are measurements of induced economic activity brought about by direct effects. This analysis addresses indirect jobs and expenditures that may be generated, based on multipliers from equivalent analyses.

Cumulative impacts from changes in other productive uses on federal and non-federal

lands may also result. This analysis generally considers changes in coal production and grazing operations in the FFO area. Under all alternatives, projections for coal production in the San Juan Basin are relatively stable with a slight reduction in annual production over the next 20 years. Specific mines are expected to close in the FFO (McKinley and La Plata) but new mines are likely to open. This would be largely market-driven, with the underlying premise that the region's power plants will continue to operate and generate demand. Also, that given current infrastructure, certain plants need coal supplied from nearby sources. Overall, coal jobs are expected to stay about at current levels, although there may be some fluctuations and possible declines up to 8 percent (about 100 jobs) over 20 year period. Also, the location of any future operations may be more (or less) favorable for workers in some locations in respect to driving distances to work or the need to relocate. The relative contribution from the coal industry compared to oil and gas would remain small but important as a stabilizing component.

Table 4-14 compares the impact of the alternatives on employment. The job numbers are based on the average number of employees expected per well site per year for maintenance and development functions (BLM 2000d, e). They include both direct jobs (those described above), and indirect and induced jobs. These are jobs that are generated to support oil and gas field functions (such as suppliers of well equipment), and jobs that are generated as a result of earnings and spending from oil and gas industry jobs. For example, there may be demand for additional services or economic activity that stimulates jobs across several industrial sectors (i.e., retail and wholesale trade, services, real estate and banking, etc.). It is expected that most jobs would be local (in San Juan and Rio Arriba Counties) and primarily in the tri-cities area. These estimates represent average projected jobs. They do not take into account variabilities in market demand and responding fluctuations in production and employment that are character-

istic of the industry. Under all alternatives, boom-bust cycles are likely to continue. Assuming that about 80 percent of wells are on federal land, total employment in the San Juan

Basin associated with oil and gas industry would be about 20 percent higher than the levels shown in the table.

Table 4-14. Average Annual Oil and Gas Employment for Federal Minerals in the Planning Area

	Employment			
	Alternative A	Alternative B	Alternative C	Alternative D
Current Oil and Gas Employment				
Average annual development jobs ¹	860			
Estimated current maintenance oil and gas jobs	6,870			
Total estimated current oil and gas jobs ²	7,730			
Projected New Employment				
New development jobs	7,760	20,370	15,590	15,730
Average year development jobs ³	390	1,020	780	790
New maintenance jobs (20 th year) ⁴	-740	1,300	580	610
Total oil and gas jobs (20 th year) ⁵	6,520	9,190	8,230	8,270
Change from current levels	-1,210	1,460	500	540
Existing employment in planning area	124,851	124,851	124,851	124,851
Percent change in regional employment (%)	-1%	+1%	+0.3%	+0.4%
Change from current oil and gas employment (%)	-16%	+20%	+6%	+7%

Source: BLM 2000d, e.

- Notes: (1) Jobs for development of new wells and infrastructure have varied over the last 10 years. The estimates in this table are based on recent years (2000 and 2001). These years represent higher levels of development (and therefore more jobs) than was typical in the last 10 years. The estimates are derived from numbers of employee days for specific development and maintenance functions, and multipliers that account for indirect and induced jobs generated by expenditures by the oil and gas industry (BLM 2000d, e).
- (2) Oil and gas jobs associated with development on non-federal land would increase these totals by about 20 percent.
- (3) Based on an assumed 20-year buildout of projected wells.
- (4) For maintaining new wells. Negative values reflect loss of maintenance jobs when the overall number of new wells is less than those that go out of production.
- (5) Includes maintenance of existing wells and new wells (accounting for decommissioned wells) and new development jobs.

Table 4-15 compares expenditures across the alternatives. These account for costs associated with development of new wells, and maintenance of existing and new wells in the planning area. A recent technical report on the Economics of Alternative Drilling Technology (available from the FFO) estimates the average

drilling cost per well by alternative. Other average functional costs and multipliers were also used to calculate the total direct and indirect expenditures for projected oil and gas operations (BLM 2000d, e). These values represent a comparative baseline and may not include all expenditures over the next 20 years.

Table 4-15. Expenditures for Oil and Gas Development for Federal Minerals in the Planning Area

	(\$000)			
	Alternative A	Alternative B	Alternative C	Alternative D
Cost per new well (drilling)	551	541	535	536
New wells (drilling)	2,436,000	7,182,000	5,262,000	5,329,000
New compressors	95,625	360,000	360,000	360,000
New pipeline	162,000 ²	540,000	540,000	540,000
Total direct costs	2,694,000	8,082,000	6,162,000	6,229,000
Indirect expenditures (1.28 multiplier ¹)	754,200	2,263,000	1,725,000	1,744,000
Total expenditures over 20 years	3,448,200	10,345,000	7,887,000	7,973,000
Per year average expenditure ²	172,410	517,250	394,370	398,660

Sources: BLM 2000d, e; SAIC 2002c.

Notes: (1) Multiplier from BLM 2000e.

(2) Does not include cost for new oil and gas roads.

When compared to overall employment, earnings, and revenues in the planning area, the effects of the alternatives are not anticipated to result in measurable changes in demographics, economic activity, public infrastructure and services, or local government services of the region.

Recreation and tourism are becoming increasingly important to the economy of the planning area. Various forms of outdoor recreation are popular, and they sometimes come in conflict with one another. Increased oil and gas development could have a negative impact on some types of recreation. Because there is no data on current levels of public use of FFO lands for recreation, it is not possible to estimate relative changes in recreational use and associated economic activity, except qualitatively. Changes in the visual landscape, cross-country access, and increased noise can affect the recreational qualities for some users and visitors. However, increased population and current trends in outdoor recreational activities suggest that this industry will not decline over the next 20 years. Also, the FFO is actively promoting and managing for popular vehicular sports (both motorized and unmotorized). These activities should overall

provide for stable economic contributions from recreation and related tourism in the region.

Employment

Under this alternative, based on a total of about 220 new wells and reclamation of 211 wells per year on average over the next 20 years, there would be a loss in development jobs of about 400 to 500 jobs per year in the planning area. This is based on current levels of development in the planning area. There would be a loss of maintenance jobs over 20 years (740 fewer by the twentieth year), resulting in an overall average decline in oil and gas employment on federal land of about 16 percent in the long-term. Short-term changes would be minimal. This would have a moderate impact on oil and gas industry employment in the planning area, but minimal impact overall for the region.

Employment in the coal industry may fluctuate due to production both on federal and non-federal land. Some mines are forecast to decline in production, notably La Plata and McKinley on FFO land. However, the San Juan Underground mine should increase production, offsetting losses in jobs basin-wide. In response to market demands and resource potential, new

mines may open. These are most likely to be located on the competitive coal lease tracts or within the Coal Belt SMA where most of the resource is located. However, other areas both on federal or non-federal land could be developed if found to be viable. Specific proposals would undergo permitting and environmental review. Overall, 20-year production for the San Juan Basin is estimated to peak in the next year or so and decline slightly but remain stable thereafter (Hill and Associates 2000). Associated jobs are likely to reflect the same pattern, with some potential fluctuations and change in the location of jobs.

Displacement of grazing due to resource development or other FFO actions would be small and have little effect on jobs.

Development Expenditures

An analysis of well development costs found that under Alternative A, the cost for drilling 4,421 wells is estimated at just over \$2.4 billion, at an average cost of about \$551,000 per well (SAIC 2002c). The average well cost for this alternative was the most expensive among all the alternatives. This affects industry by increasing production cost and lowering profit margins. Additional direct costs for roads, pipelines, compressors and equipment would increase the total investment to about \$2.7 billion. Additional indirect expenditures could result in a total of just over \$3.4 billion spent over 20 years, an average of \$172.4 million per year (non-escalated). This represents a considerable decline in expenditures and rate of development over current levels but within the range experienced over the last 10 years. If current levels were projected into the future at the same cost per well as projected for this alternative, it is expected that average expenditures would be about \$446 million per year. Alternative A would fall short of current development expenditures by almost 260 percent.

Development of new mining facilities could generate expenditures in the local economy for goods and services. When specific proposals are identified the impact on the local economy

would be further assessed. Individual proposals would be assessed. These would generally have positive impacts on the local economy.

Revenues

Under Alternative A, the projected volume of oil and gas production on federal land over the next 20 years is estimated at 4,910 billion cubic feet (Bcf). (Calculations are based on gas values, because oil accounts for a very small portion of the fluid mineral product in the planning area.) Assuming a value of \$3.00 per Mcf (NMDFA 2001), the total value of this product could be about \$15 billion (in 2001 dollars). Additional production on non-federal land could increase this value by about 30 percent.

It is difficult to predict royalties and taxes for any given year in the future because some existing wells would go out of production and new wells added each year. Also, the variability of gas prices could considerably alter the taxable base value. Under this alternative, there would be a slight increase in production potential over the next 20 years over the existing levels, based on new well development and projected well abandonment. With New Mexico deriving between 10 and 20 percent of its general funds from energy resources, this would provide a stable tax revenue base over the long term. However, it should be noted that although this alternative would result in a small and gradual increase in production potential over current levels over the long-term, production potential would not grow as rapidly as it would if the current day rate of new development were sustained.

In addition to oil and gas taxes, there would also be continuing taxes on other minerals (primarily coal in the planning area). Under this alternative, future development of competitive coal tracts or suitable lands in PRLAs in the FFO is possible. Based on assessments by Hill and Associates (2000), several options could meet the demands of the San Juan power plant. The nearby La Plata competitive lease tracts could be developed in addition to ongoing expansion of the San Juan Under-

ground mine. San Juan could also be supplied by a possible expansion of the Navajo mine (not on FFO land). Development of additional Lee Ranch tracts could make up for projected declines of Lee Ranch mine, but this coal would continue to go to out-of-state customers. Production of federal minerals would continue to provide royalty revenues over the planning period. Royalties may decline slightly as projected production of the La Plata, McKinley, and Lee Ranch mines decline (Hill and Associates 2000).

Under all alternatives, future tax and royalty revenues will depend on market value, production volume, location, and owner of the produced energy mineral resources. Also, tax policies and assessed rates will continue to determine the total revenue value. Each of these variables can greatly influence future revenues to the state and local jurisdictions.

Ongoing PILTs paid to local governments would remain essentially unchanged. These represent a relatively minor source of revenues for the four counties in the planning area.

Environmental Justice

Each of the counties in the planning area has a high proportion of minority populations compared to the state and nation as a whole. McKinley and San Juan County have a distinctly high percentage of American Indians, while Rio Arriba has a large Hispanic population, and all but Sandoval County have higher levels of low-income populations. Four Indian reservations either overlap or are adjacent to the planning area. Consequently, the potential exists for minority and low-income populations to be affected by the alternatives under consideration in this Proposed RMP/Final EIS.

Specific issues of concern for this analysis include:

- Potential for economic impacts (such as job losses or increases).
- Potential for land use impacts (such as noise impacts from compressors, or displacement of communities or existing

uses where minority or low-income persons reside or work).

- Potential for conditions that pose a public health or safety risk (such as those that deteriorate air quality or release hazardous materials).

Concern has been expressed about royalty payments for federal mineral resources on Indian lands. Resolution of this legal issue is beyond the scope of this EIS.

Because of the broad scale of this EIS, it is not possible to determine the location of projected new oil and gas development and, therefore, potential impacts on specific communities or residents are not predictable. Any potential impacts, such as noise from compressors, or placement of large equipment that is incompatible with residential uses, would be addressed in site-specific APDs. Similarly, avoidance of specific resources, such as sensitive plant species or cultural sites, would be implemented at the site-specific level.

Most activities taking place on federal land in the San Juan Basin occur without influence of demographic or income values, but rather, in response to various resource values. In general, resource production and protection is balanced for overall public benefit. Specific activities may take place in locations that affect specific local populations or individuals that may be disproportionately minority or low-income in composition. This is particularly likely for Rio Arriba and McKinley counties that have high percentages of the population in both these categories. Change in energy resource production has the greatest potential to affect these counties that derive tax revenues from these industries and where jobs are particularly needed (Table 3-24, Table 3-30).

Under Alternative A, there may be minor job losses in energy related jobs. However, new coal mines, not yet identified, may benefit some communities more than other by providing jobs. Increased employment opportunities are generally evaluated as positive impacts for the area, and could benefit areas where the labor pool is comprised of minority and low-income

population. Localized impacts from siting of future wells or mines may affect communities or isolated residences. Given the population characteristics, these may be impacts to persons of minority and/or low-income status. However, site selection per se, is driven by resource value, development costs, and ownership issues. Future applications and approvals would be subject to environmental review. Approvals would consider necessary mitigation to reduce specific incompatibilities between proposed development and any sensitive human activities.

Some displacement of multiple uses on federal land from new well facilities and changes in stipulations and management prescriptions would slightly reduce the availability or quality of some resources for the public at large. Potentially affected resources include recreation, grazing, wood gathering, access, cultural sites, mineral entry and leasing,

and visual qualities. These impacts would generally occur away from population centers and would not directly affect particular populations.

The positive effects of additional jobs and economic activity in the region from oil and gas development have the potential to benefit all residents. Under Alternative A, some loss of jobs and economic activity in the oil and gas industry could have minor negative effects. It is not possible to identify specific jobs or businesses that would be affected. Oil and gas development on non-federal land, including Indian lands, is not projected to decline.

Land disposal actions proposed for the tri-cities area could increase the supply of land available for urban development. This could offset trends for rising land prices as buildable and serviceable land is depleted. Indirectly, this could benefit low-income persons by preserving a supply of affordable housing.

ALTERNATIVE B—RESOURCE PRODUCTION

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 24,781 acres for Alternative B. This does not include plugged and abandoned wells already awaiting approval for reclamation. Surface disturbance associated with large pipelines is assumed to be 11,716 acres. Approximately 1,700 acres of disturbance would be associated with the installation of 20 Phase 1 compressors and 300 Phase 2 compressors (Table 4-1). There would be an additional 13,800 acres of initial short-term surface disturbance that would be revegetated after construction.

Watersheds

Under Alternative B, short-term surface disturbance is estimated to total approximately 42,000 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the planning area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 30 to 232 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 2 and 18 percent in those watersheds. The total increase would be approximately 1,075 miles in the high development area (Table 4-3). This would result in a potential increase in sediment

yield due to the additional acreage of bare soil and miles of unpaved roads, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced when well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative B would allow access to hydrocarbon reserves without the need to commingle production or use dual completions. The number of completions allowed under this alternative would be 13,275 on federal minerals after consideration of surface constraints that would limit access to 17 wells. Each completion would produce from a single well bore. NSO restrictions would require 84 directional wells (0.6 percent of all wells) to be drilled to access reservoirs under SDAs and Navajo Reservoir. There would be 28,273 acres closed to new leasing in the planning area.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, the largest number of quarries would be constructed under Alternative B. These small quarries would be approved with APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under Alternative B, 347,505 acres of public land would be available for disposal, of which approximately 265,000 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas, resulting in fewer conflicts and limits to these important deposits through improved planning and coordination.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under Alternative A because access to these areas would be preserved to the extent possible by FFO resource managers.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitations imposed on how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within SDAs in the FFO, there would be 1 well that would not be developed and approximately 26 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of the limitations on mineral leasing would be in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

There would be more potential conflicts for mineral extraction, especially in the coalbed methane-producing formations, under this alternative because the total number of oil and

gas well sites approved over the next 20 years would be the highest of all the alternatives. The areas identified as suitable for coal mining development after application of most of the unsuitability criteria (378,875 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation. The Additional Coal Interests shown on Map 2-8 are south and west of the high development area, so fewer conflicts would be anticipated.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have the greatest short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 41,900 acres, with 13,800 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be almost 24,800 additional acres (Table 4-1). The resulting impacts to soils would be a potential increase in soil erosion due to the increase in bare ground and unpaved roads.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area, and more wells would be completed.

OHV Use

Limited OHV access over most of the FFO area would result in less potential for damage to vegetation and soil crusts, and thereby less potential for sheet, rill, and gully erosion through enforcement of OHV designations. Increased soil erosion would be expected to result where OHVs are permitted to ride on

existing trails because they would increase soil compaction and further reduce existing vegetative cover while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts would be eliminated from consideration. Site-specific evaluations of potential soil impacts would be conducted before final open designations are made.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, all of which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative B, new oil and gas development would result in a net increase in long-term surface disturbance of almost 24,800

acres (Table 2-1). Water required for the drilling operations would amount to over 9,347 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to a greater area of surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in short-term impacts to water resources as a result of sedimentation from the increased acreage of short-term surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tricity area that would be considered for development could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative B are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative B, potential impacts to water resources would be less than under Alternative A even with the potential designation of additional open acreage (Table 2-10) added as the OHV Activity Plans are completed. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted and in the bottoms of washes.

Specially Designated Areas

Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. In situations where OHV cross-country travel would be permitted within a SDA, a localized negative impact to water resources could result. The management prescriptions in the majority of SDAs provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in slightly more acreage than under Alternative A, but still a small percentage (less than 20 percent) of the total FFO area.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils,

minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative B proposes to develop 13,275 new gas wells on federal lands, which would produce approximately 11,158 Bscf of gas over a 20-year period. Information from the RFDS (Engler et al. 2001) and consultations with natural gas industry representatives (Bays 2001; Brown 2001; Gantner 2001) and the NMAQB (Uhl 2001) were considered in the estimation of emissions for each year of the alternative. Assumptions used in the emission estimations include the following:

1. The alternative would develop 663 new gas wells each year.
2. Half of the new gas wells would require the use of a 95 HP gas-fired compression unit. Each unit would operate at 100 percent load for 85 percent of the year. The average emission factors from NMAQB source test data of 12 existing wellhead compression units ranging in size from 65 to 145 HP were used to calculate annual emissions of criteria pollutants from these sources (NMAQB 2001a). The average NO_x and CO factors obtained from these data were determined to be 13.2 and 13.1 grams per horsepower-hour (gm/HP-hr), respectively.
3. Half of the new gas wells would require the use of a 250,000 BTUs per hour gas-fired separator unit. These units would operate 50 percent of the year at 100 percent load. Emission factors for these sources were obtained from the USEPA (USEPA 1998).

4. An additional 18,000 HP of central compression would be developed in each year of the period of analysis. These units would operate 100 percent of the year at 90 percent load. The average emission factors from NMAQB source test data of 39 existing units ranging in size from 2,500 to 4,500 HP were used to calculate emissions of NO_x and CO from these sources (NMAQB 2001a). These factors were determined to be 1.6 and 1.3 gm/HP-hr for NO_x and CO, respectively.

Table 4-16 presents estimated emissions from gas production under Alternative B for the first and last year of the 20-year period of analysis. These data show that the overwhelming majority of emissions from this activity would occur from wellhead compression demands. The project emission

calculations assume a constant high well compression demand for the life of a given well. However, emissions for these sources in project years 1 and 20 are somewhat overestimated, as 50 percent of the proposed wells would not need wellhead compressors at such an early age of production, as was assumed in the emission calculations. The net change in proposed annual emissions from current levels would be offset somewhat due to the abandonment of existing production.

The emission estimates for the proposed wellhead compressors may be of importance to future air quality planning in the region. Wellhead compressors are generally small enough to fall below the NMAQB permitting and NOI emission inventory processes, but they represent a potentially substantial future emission source category in the region.

Table 4-16. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative B (Tons per Year)

Equipment Type/Scenario	VOCs	CO	NO _x	PM ₁₀
Project Year 1				
Wellhead Compression	77.6	3,377.0	3,402.9	0.0
Separator Units	1.1	8.0	18.9	1.5
Central Compression	73.5	201.8	256.5	0.0
Alternative B - Tons per Year	152.3	3,586.8	3,678.3	1.6
P&A Wells - Tons per Year	(8.3)	(340.9)	(344.9)	(0.2)
Alternative B Net Change (Alt B - P&A)	144.0	3,245.9	3,333.4	1.4
Project Year 20				
Wellhead Compression	1,552.6	67,539.6	68,057.2	0.5
Separator Units	22.1	160.6	377.5	30.5
Central Compression	1,470.4	4,035.9	5,130.9	0.3
Alternative B - Tons per Year	3,045.1	71,736.1	73,565.5	31.3
P&A Wells - Tons per Year	(273.7)	(11,273.8)	(11,404.7)	(5.1)
Alternative B Net Change (Alt B - P&A)	2,771.5	60,462.3	62,160.7	26.2

Note: Totals do not sum due to rounding.

Near-Field Impact Analysis

Air quality dispersion modeling was used to estimate the near-field pollutant impacts that would occur from implementation of Alternative B. The intent of the analysis was to identify a reasonable but conservative upper bound of impacts that would occur from the project alternatives. Alternative B was selected for the modeling analysis because it would produce the greatest amount of air emissions and resulting impacts. All other project alternatives would be expected to produce less air quality impacts.

Air quality modeling only evaluated operational emission sources. Proposed construction activities associated with gas development would be similar to the construction activities immediately north of the planning area, described in the Oil and Gas Development on the Southern Ute Indian Tribe (SUIT) Draft EIS (DEIS) (BLM 2000e). This document presents a detailed and conservative modeling analysis of both combustive and fugitive dust (PM₁₀) emission sources associated with well pad construction activities. The results of the analysis showed that construction activities would produce pollutant impacts that would remain below the ambient air quality standards. The maximum impacts from proposed construction activities and fugitive dust sources were shown to occur very close to the activity location source, with concentrations decreasing rapidly with distance from the source.

The exact locations of operational emission sources associated with proposed gas development are not known at this time. Therefore, the near-field analysis modeled a reasonable but conservative module of project emission sources that could occur at a generic location within a projected high-density well development area (greater than 6 wells per square mile). This scenario would produce an upper bound of impacts that would be expected to occur from any combination of proposed sources within the planning area. The results of the modeling analysis indicate that

impacts from proposed operation emission sources would decrease rapidly with distance from the sources. Therefore, it is expected that distant emissions sources would not substantially contribute to near-field impacts analyzed for the project emissions module.

Definition of the proposed emissions module was based on information obtained in the RFDS and in consultation with natural gas industry representatives (Bays 2001, Brown 2001, and Gantner 2001). To be conservative, the analysis focused on the Dakota formation, which would potentially develop up to eight wells per section (square mile). The areal extent of the emissions module was four sections that included 32 wells. The RFDS assumes that 50 percent of the future wells developed in the San Juan Basin would have well compressors rated at approximately 95 HP. However, to be conservative, it was assumed that each well would have a 95 HP gas-fired well compressor. The RFDS assumes that the San Juan Basin would require an additional 360,000 HP of central compression. Therefore, a 10,000 HP central compressor station was included as part of the emissions module. This scenario is based on a high-density well placement and is deemed to represent an upper bound of emissions that would produce near-field impacts within the planning area under any alternative.

The emission module source layout has well compressors placed at the center of each 80-acre parcel and the central compressor station situated at the end of the four sections (see Figure 1 in the Air Quality Technical Report). This arrangement was selected to maximize the overlap of emission plumes that would disperse from the various sources. The well compressors were assumed to be 95 HP Caterpillar, Inc., Model 3304 natural gas-fired engines. The compressor station was designed with three Caterpillar Model 3612 natural gas-fired engines, each rated at 3,350 HP. To produce a conservative analysis, the highest emission rates between vendor emission estimates and the NMAQB source test data previously mentioned in the discussion of

project annual emission estimations were used in the modeling analysis. As a result, the highest NO_x and CO emission factors for the well compressors units were determined to be 15.8 (Kaufman 2001) and 13.1 grams per horsepower-hour (gm/HP-hr) (NMAQB 2001a), respectively. The NO_x and CO emission factors used in the analysis for the Caterpillar 3612 engine were 2.0 and 2.5 gm/HP-hr, respectively. The CO emission factor was based on vendor data (Caterpillar Inc., 2001). The NO_x emission factor for the 3612 engine provided by Caterpillar was 0.7 gm/HP-hr. However, the analysis used a more conservative NO_x factor of 2.0 gm/HP-hr to simulate implementation of the emission limitation associated with the Level One Oil and Gas Installations Air Quality Permit issued by the NMAQB under Regulation 20 NMAC 2.72 (Construction Permits).

To further identify maximum impacts, all sources were modeled as operating 24 hours per day and 365 days per year. Stack parameters for modeled emission sources were obtained from Caterpillar, Inc., and the NMAQB.

The Air Quality Technical Report describes (1) model selection; (2) the modeled emission sources and their stack characteristics; (3) selected emission factors and calculated emission rates; (4) the receptor grids used; (5) selected model options; and (6) meteorological data (SAIC 2003).

State and National Ambient Air Quality Standards

The Industrial Source Complex Short Term (ISCST₃) model was used to predict the maximum concentrations of criteria pollutants that would occur from the emissions module. Considering that natural gas would be the fuel used by the overwhelming majority of proposed sources, NO_x (NO₂) and CO will be the pollutants emitted in the greatest amounts. Sulfur dioxide (SO₂) and particulate emissions (both TSP and PM₁₀/PM_{2.5}) would be small, given the low sulfur content and low particulate content of the natural gas fuel.

The modeling analysis evaluated the emissions module as if it were in flat terrain, due to the lack of site-specific development information. This approach is reasonable, given the programmatic nature of the RMP/EIS. However, dramatic variations in topography occur within the project region and predicted impacts of air effluent plumes in complex terrain can be substantially greater compared to those in flat terrain. The NMAQB permitting process would require the use of site-specific terrain data to ensure identification of maximum pollutant impacts from proposed emission sources within its surrounding terrain.

The highest CO and NO₂ concentrations measured at the Farmington and Bloomfield monitoring stations during the period from 1995 to 2001 (see Table 3-14) were added to the maximum predicted project pollutant concentrations, and the resulting total project impacts were compared to the applicable ambient air quality standards to determine their significance. Monitored pollutant data from the Bloomfield station simulates some of the highest pollutant impacts recorded within the planning area from existing sources. The Bloomfield station was sited by the NMAQB to monitor elevated pollutant impacts from the highly industrialized Bloomfield gas corridor (Uhl 2001). Emissions sources from the El Paso Blanco compressor station and Conoco San Juan Gas Plant occur within 2 kilometers (km) (1.24 miles) of the Bloomfield monitoring station. These are the third and fifth largest sources of NO_x in San Juan County, and their combined emissions in 1996 were 2,714 tons of NO_x (USEPA 2001b). The annual NO_x potential-to-emit levels for these two facilities are about 3,800 tons per year (NMAQB 2001b). Excluding the Four Corners and San Juan power plants west of Farmington, approximately 40 and 52 percent of the remaining NO_x emissions emitted in San Juan County occur within 5 and 10 km (3.11 and 6.21 miles) of the Bloomfield monitoring station. That equates to roughly 3,500 and 5,000 tons per year of NO_x emissions, respectively, that occurred in 1996 within these

radii (USEPA 2001b). There are no other areas within the planning area that have this density of emissions. Therefore, the use of ambient pollutant data monitored at the Bloomfield station provides a representative measure of the most severe air quality impacts from existing sources within the planning area.

Use of ambient pollutant data to simulate existing emission sources in a modeling analysis is an appropriate method for this EIS due to the large area and land use plan nature of the RMP/EIS. However, this may not be a thorough method for a permitting analysis under NMAQB guidelines, as due to proximity and meteorological effects, the monitoring station may not capture the maximum pollutant concentrations from all existing sources. The monitored data also may not represent future air quality conditions if they do not include impacts from approved, yet un-constructed emission sources.

Meteorological data collected at the Bloomfield monitoring station were used in the near-field modeling analysis. These data have a high frequency of westerly and easterly winds, due the presence of the east-west alignment of the San Juan River Valley. These data also show a high frequency of northerly winds, which occur from nighttime drainage flow down the Bloomfield Canyon. These data show that terrain has a substantial effect on local wind conditions. Hence, a site-specific dispersion modeling analysis would have to use meteorological data that is representative of the proposed project site.

To be consistent with NMAQB dispersion modeling guidelines, background pollutant data and ambient air quality standards were converted from units of ppm to $\mu\text{g}/\text{m}^3$ to take into consideration the effects of elevation (NMAQB 1998). To be conservative, the emissions module was analyzed at an elevation of 6,000 feet. For example, this procedure would convert the NMAAQs 24-hour NO_2 standard of 0.10 ppm to $153 \mu\text{g}/\text{m}^3$.

Table 4-17 summarizes the ambient pollutant impacts predicted for Alternative B. These data show that the emissions scenario evaluated for natural gas development under Alternative B would contribute to an exceedance of the 24-hour state NO_2 standard, which would be a potentially significant air quality impact. The emissions module would not contribute to an exceedance of any other ambient air quality standard. As part of the NMAQB permitting process, proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour would be required to demonstrate compliance with the ambient air quality standards prior to gaining approval for construction (Regulation 20 NMAC 2.72). This would include a consideration of existing emission sources and terrain features within the proposed source region of influence. Measures that could reduce predicted significant pollutant impacts include the reconfiguration of emission source locations, enhancement of effluent plume rises, and additional emission controls. Modeling result printouts for maximum impact cases are provided as Attachments 1-4 in the Air Quality Technical Report.

During the NMAQB permitting process, if an initial dispersion modeling analysis shows that proposed emission sources contribute to an exceedance of an ambient NO_2 standard, a second tier analysis is performed to more accurately estimate ambient NO_2 impacts. This ozone limiting method (OLM) considers atmospheric chemistry and the role ambient O_3 plays in converting NO_x emissions to ambient NO_2 . It is possible that use of the OLM in the dispersion modeling analysis for this EIS would reduce the maximum NO_2 impacts estimated for the project emissions module to the point that they would not contribute to an exceedance of the State 24-hour standard. However, to be conservative, it is assumed that proposed NO_x emissions would remain potentially significant.

Table 4-17. Maximum Pollutant Impacts Analyzed for Gas Production— Alternative B

Pollutant	Averaging Period	Modeled Maximum Impact ($\mu\text{g}/\text{m}^3$)	Background Concentration ¹ ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	NAAQS ² ($\mu\text{g}/\text{m}^3$)	NMAAQs ² ($\mu\text{g}/\text{m}^3$)
Carbon Monoxide	8-hour	332	4,838	5,170	8,374	8,095
	1-hour	778	8,560	9,338	32,567	12,189
Nitrogen Dioxide	Annual ³	33	17	50	81	76
	24-hour ⁴	120	50	170	—	153

Notes: (1) Background concentrations of CO and NO₂ are equal to the maximum values monitored at the Farmington and Bloomfield monitoring stations during the period 1996-2001 (see Table 3-14). Data then converted from units of ppm to $\mu\text{g}/\text{m}^3$ for an elevation of 6,000 feet (NMAQB 1998).

(2) AAQS converted from units of ppm to $\mu\text{g}/\text{m}^3$ for an elevation of 6,000 feet (NMAQB 1998).

(3) Annual NO₂ modeled impact is equal to the maximum-modeled NOx impact times a factor of 0.75 (NMAQB 1998).

(4) 24-hour NO₂ modeled impact is equal to the maximum-modeled NOx impact times a factor of 0.4 (NMAQB 1998).

Wellhead compressors contributed the overwhelming majority of ground level pollutant concentrations at the predicted maximum impact locations. The central compressors only contributed approximately 2 percent of the total NO₂ impact for either the annual or 24-hour averaging periods at these locations. Despite being larger emission sources, the central compressor units have stack characteristics that produce a much higher plume rise, compared to the wellhead compressors. As a result, by the time the plumes from these larger sources impact ground level, their pollutant concentrations are substantially diluted.

Prevention of Significant Deterioration Increment Consumption

Modeling results indicate that the high-density module of proposed compressor emission sources would generate a maximum annual NO₂ impact of 33 $\mu\text{g}/\text{m}^3$. This impact is greater than the annual PSD Class II increment (25 $\mu\text{g}/\text{m}^3$) and is potentially significant. Emissions from the wellhead compressors are predicted to produce the overwhelming majority of this impact. Under NMAQB Regulation 20 NMAC 2.72 (Construction Permits), proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour would be required to demonstrate compliance with the PSD increments, in

addition to the ambient air quality standards. In the event of PSD review, a detailed analysis would occur at the time of permitting to determine the amount of NO₂ increment consumed by a proposed source(s). Existing and approved emission sources in the project area consume PSD increment and therefore the amount of increment available to new sources is something less than the total increment. There are several localized areas within the planning area where the available PSD Class II increment is nearly exhausted (such as the Bloomfield gas corridor). As a result, a permit application for the proposed emissions module within this area would be denied under the requirements of NMAQB Regulation 20.2.72, unless emission reductions were provided to offset a large portion of PSD increment consumed by the module. However, since Regulation 20.2.72 only applies to sources that emit more 25 tons per year or 10 pounds per hour of a pollutant, the wellhead compressors would be exempt from these requirements, unless a portion or all of their emissions were combined to represent one permit unit or source.

Impact Radius

The impact radius for the various pollutants and averaging periods of concern (i.e., the distances at which module impacts would fall below the pollutant-specific significance levels)

was determined by examining the coarse grid modeling runs. For NO₂, the distances where the annual and 24-hour averaging period impacts drop below their significance levels of 1 and 5 µg/m³ would be 40 and 25 kilometers, respectively. For CO, it was determined that all modeled impacts, including the maximum value, would be below the 1- and 8-hour significance levels of 500 and 2,000 µg/m³.

Incremental Risk from Hazardous Air Pollutants

Proposed natural gas-fired sources would emit various HAPs, including 1,1,2,2-tetrachloroethane; 1,1,2-trichloroethane; 1,1-dichloroethane; 1,3-butadiene; acetaldehyde; acrolein; benzene; carbon tetrachloride; chlorobenzene; chloroform; ethylbenzene; ethylene dibromide; formaldehyde; methanol; methylene chloride; n-hexane; naphthalene; styrene; toluene; vinyl chloride; and xylene. However, 1,3-butadiene, acetalde-

hyde, acrolein, benzene, and formaldehyde are the only HAPs that would be emitted in sufficient quantities from proposed operations to pose an appreciable risk to public health. These five pollutants are therefore analyzed in detail. The risk from these pollutants would be in the form of either potential cancer risk or non-carcinogenic risk to a target endpoint such as the kidney, liver, eye, reproductive system, respiratory system, cardiovascular system, central nervous system, or immune system.

Table 4-18 presents a summary of the averaging period and health risk concerns for each of these pollutants. Non-carcinogenic health risks occur as either a long-term (chronic) or short-term (acute) concern. Factors used to estimate HAPs emissions from proposed natural gas-fired sources were obtained from *Compilation of Air Pollutant Emission Factors, AP-42* (USEPA 2000).

Table 4-18. Risk Assessment Concerns for HAPs Emitted from Gas Production— Alternative B

Pollutant	Averaging Period		Cancer Risk	Non-Cancer Risk (Chronic)	Non-Cancer Risk (Acute)
	Annual	Short-Term			
1,3-Butadiene	X		X	X	
Acetaldehyde	X		X	X	
Acrolein		X		X	X
Benzene	X	X	X	X	X
Formaldehyde	X	X	X	X	X

Acceptable Ambient Concentration Levels (AACL) or Reference Exposure Levels (REL), as reported in the USEPA's National Air Toxics Information Clearinghouse database (USEPA 1997a) and in California's Office of Environmental Health Hazard Assessment (OEHHHA) database (OEHHHA 2002), are used to determine the potential for acute or chronic health risk. The AACLs and RELs are the maximum exposure concentration levels at which no adverse health effects would occur. **Table 4-19** shows the AACLs/RELs compared to the maximum concentrations predicted by

the ISCST3 model to occur from emissions associated with the high-density area source module (as described above and in the Air Quality Technical Report). With the exception of short-term acrolein, the results in Table 4-19 indicate that emissions from the module would not be sufficient to cause an acute or chronic health concern. Maximum concentrations would be less than the AACLs/RELs. The short-term AACL/REL for acrolein was established based on an exposure concentration that caused mild eye irritation to some subjects over a period of one hour.

Table 4-19. Comparison of Maximum Ground-Level Concentrations from Gas Production to AA CLs/REIs— Alternative B

Pollutant	Acute Health Risk		Chronic Health Risk	
	Maximum Short-Term Concentration ¹ (µg/m ³)	Acute AA CL/REL ²	Maximum Annual Concentration ¹ (µg/m ³)	Chronic AA CL/REL ²
1,3-Butadiene	--	NA	0.002	20
Acetaldehyde	--	NA	0.03	9
Acrolein	0.46	0.19	0.02	0.06
Benzene	0.06	1,300	0.01	60
Formaldehyde	4.7	94	0.16	3

Notes: (1) The emissions source module and modeling techniques are described in the Air Quality Technical Report.

(2) Sources: USEPA 1997a; OEHHA 2002.

Long-term incremental exposure to the carcinogenic compounds (1,3-butadiene, acetaldehyde, benzene, and formaldehyde) is evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime. The cancer risk is calculated by summing the products of the maximum annual average pollutant concentrations predicted by the ISCST₃ model times the applicable USEPA unit risk factors (USEPA 1997b). The resulting estimated cancer risk is compared to the range of accepted cancer risk criteria of an increase of 1 to 100 cancer cases per million people (1×10^{-6} to 100×10^{-6}), as found in the Superfund National Oil and Hazardous Substances Pollution Contingency Plan (USEPA 1990).

Two estimates of cancer risk were computed: (1) a maximally-exposed individual (MEI) risk and (2) a most-likely exposure (MLE) risk. The typical USEPA criterion for cancer risk assumes that a person will be continuously exposed to maximum HAP concentrations for a period of 70 years. However, the USEPA allows adjustments to reflect the normal years of residence at a specific location. For the MEI scenario, the exposure duration is assumed to be the typical life of a natural gas well (20 years). Therefore, the MEI residency adjustment factor is $20 \div 70$, or 0.286. For the MLE scenario, the exposure duration is assumed to be 9 years, corresponding to the mean duration

that a family remains at a residence (USEPA 1993). Thus, the MLE residency adjustment factor is $9 \div 70$, or 0.129.

A second adjustment factor is applied to the MLE scenario to account for the percentage of time during any given day that a potentially exposed person would be at home and therefore exposed to the maximum HAP impact concentration. The USEPA method assumes that 64 percent of the day a person would be exposed to the maximum HAP concentration and during the remainder of the day, the person would be exposed to 25 percent of the maximum HAP concentration (USEPA 1993). Therefore, the MLE daily exposure adjustment factor is $([0.64] \times [1.0]) + ([0.36] \times [0.25])$, or 0.73. As a conservative assumption for the MEI scenario, it is assumed that a person would remain at home 24 hours per day for the entire period of exposure. Thus, the daily adjustment factor for the MEI scenario is 1.0.

Combining the two adjustment factors results in a value of $(0.129 \times 0.73) = 0.094$ for the MLE scenario, and $(0.286 \times 1.0) = 0.286$ for the MEI scenario. To calculate the incremental cancer risk for the MEI and MLE scenarios, the predicted maximum annual average pollutant concentrations were multiplied by the unit risk factors and then by the respective overall adjustment factors. As

shown in **Table 4-20**, the resulting summed values are 0.21×10^{-6} for the MLE risk and 0.65×10^{-6} for the MEI risk. Both the MLE risk and the MEI risk would be below the range of

acceptable risk criteria. The cancer risk impact of project emissions under Alternative B would be less than significant.

Table 4-20. Maximum Cancer Risk Associated with Emissions from Gas Production—Alternative B

Pollutant	Maximum Annual Concentration ¹ ($\mu\text{g}/\text{m}^3$)	Unit Risk Factor ² ($\mu\text{g}/\text{m}^3$) ⁻¹	MEI Cancer Risk	MLE Cancer Risk
1,3-Butadiene	2.40×10^{-3}	3.0×10^{-5}	2.1×10^{-8}	6.8×10^{-9}
Acetaldehyde	2.50×10^{-2}	2.2×10^{-6}	1.6×10^{-8}	5.2×10^{-9}
Benzene	5.20×10^{-3}	7.8×10^{-6}	1.2×10^{-8}	3.9×10^{-9}
Formaldehyde	1.63×10^{-1}	1.3×10^{-5}	6.0×10^{-7}	2.0×10^{-7}
TOTAL			6.5×10^{-7}	2.1×10^{-7}

Notes: (1) The emissions source module and modeling techniques are described in the Air Quality Technical Report.

(2) Source: USEPA 1997b.

Far-Field Impact Assessment

Due to the proximity of federal Class I areas to the planning area, proposed gas development sources have the potential to impact air quality in these pristine areas. The CAA allows almost no degradation of air quality in Class I areas from proposed emission sources. The Regional Haze Regulation promulgated by the USEPA in 1999 also directs states to achieve “natural” visibility conditions in Class I areas within the next 60 years.

The closest Class I areas to the planning area are the Mesa Verde National Park and Weminuche NWA in southwest Colorado and the San Pedro Parks NWA in the SFNF in New Mexico. Mesa Verde National Park is about 12 miles from the northwest corner of the project gas production region. Weminuche NWA is about 28 miles from the northern border of the project gas production region. The San Pedro Parks NWA is about 10 miles from the southeast corner of the gas production region.

Criteria used to determine the significance of air quality impacts in Class I areas have been developed for new source review as part of the NMAQB Construction and PSD permitting

processes (NMAQB Regulations 20 NMAC 2.72 and 20 NMAC 2.74). Regulation 20 NMAC 2.72 requires proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour to demonstrate compliance with the Class I increments, in addition to the ambient air quality standards. In addition to these requirements, Regulation 20 NMAC 2.74 requires that proposed major sources that emit more than 100 or 250 tons per year of a pollutant (depending on the source type) to determine the potential for these sources to affect (1) visibility and (2) atmospheric deposition of pollutants in Class I areas. The National Park Service, USFWS, and USFS, as part of their Federal Land Managers’ Air Quality Related Values Work Group process, have developed new source review guidelines for the evaluation of impacts in Class I areas. However, the criteria to evaluate impacts to Class I areas as part of the NEPA process under these guidelines are not well defined.

The following presents analyses to evaluate the impact of proposed gas production emissions to Class I areas in proximity to the project region. These analyses include (1) a quantitative analysis to estimate impacts to PSD

NO₂ increment levels and (2) a qualitative analysis to estimate visibility impacts.

PSD Increment Analysis

The ISCST3 model was used to predict the maximum annual concentrations of NO₂ within nearby Class I areas from the same emissions module analyzed for project near-field impacts. These estimated NO₂ impacts were then compared to the PSD Class I increment for NO₂ (2.5 µg/m³) to determine compliance with this standard. To minimize the transport distance of emissions from the module to each Class I area considered in the analysis, a module was placed within the nearest projected high-density well development area (greater than 6 wells per square mile) in proximity to each Class I area (See Figure 9.1-1 in the RFDS [Engler et al. 2001])). The transport distances between each emissions module and Class I area include the following:

- Mesa Verde - 19 miles to the northwest.
- Weminuche NWA - 29 miles to the north.
- San Pedro NWA 1 - 42 miles to the south-southeast.
- San Pedro NWA 2 - 42 miles to the southeast.
- San Pedro NWA 3 - 50 miles to the east-southeast.

The analysis evaluated the impact of an emissions module to the San Pedro NWA from the three closest projected high-density well development areas to ensure identification of maximum impacts.

The results of the analysis determined that the maximum annual NO₂ impact within each of the three Class I areas would be (1) 0.12 µg/m³ within Mesa Verde, (2) 0.05 µg/m³ within Weminuche NWA, and (3) 0.10 µg/m³ within San Pedro NWA. On the average, the wellhead compressors produced about 74 percent of the total impact at these locations, compared to the central compressors. Existing and approved emission sources within the project area have consumed a portion of the PSD Class I increment within each of these areas and

therefore the amount of increment available to new sources is something less than 2.5 µg/m³. However, since the NO₂ impact from the emissions module within any Class I area is a maximum of 5 percent of the Class I increment, these impacts would not be expected to contribute to an exceedance of the PSD Class I increment for NO₂.

The above analysis provides a relative sense of the impact of proposed emission sources to Class I areas. The analysis evaluated a very conservative scenario of emissions of which the majority of the sources would be exempt from a Class I increment analysis under NMAQB regulatory requirements. Nevertheless, at some point in the future the combined impact of all proposed gas production sources to Class I increment levels would be somewhat greater than the levels estimated for the emissions module. As a result, emissions from proposed sources in future years would consume some of the allowable NO_x increment within nearby Class I areas. Given the magnitude of emissions estimated for Alternative B in future years and the sensitivity of the air quality resource in Class I Areas, the impact of NO_x emissions from proposed sources to nearby Class I areas would be potentially significant.

Visibility Analysis

The SUIT FEIS (BLM 2000e) performed a far-field dispersion modeling analysis to estimate cumulative impacts from proposed gas development to visibility levels in nearby Class I areas. Its proposed action includes the maximum development of 636 coalbed methane wells and the addition of 118,000 HP of field compression. The analysis concluded that cumulative impacts could produce a “just noticeable change” to visibility on a single day at the Mesa Verde National Park and up to three days at the Weminuche Wilderness Class I areas. However, due to the conservative nature of the analysis, it is unlikely that these potential visibility impacts would actually occur.

Using the SUIT FEIS far-field modeling analysis as a means to determine the potential

for visibility impacts to Class I areas from the FFO proposed actions is difficult. Both projects propose gas development in adjacent regions, although the FFO proposed emission sources are more to the southeast and generally farther away from the Mesa Verde Class I area when compared to the SUIT project sources. As a result, the variations of meteorology and terrain between the two source regions and Mesa Verde would produce somewhat different pollutant transport conditions and ensuing impacts to this Class I area. In addition, substantially higher gas development is proposed in the FFO planning area compared to the SUIT FEIS alternatives. The maximum amount of emissions modeled for the SUIT analysis was 4,527 tons per year of NO_x. Proposed development under Alternative B in year 20 could increase annual VOC and NO_x emissions from current levels by 2,700 and 62,000 tons within the San Juan Basin, excluding emissions from the abandonment of existing production wells.

Due to the proximity of the Mesa Verde National Park to the planning area's high development area in the northwest part of the San Juan Basin, gas production emissions from Alternative B would have the highest potential to impact visibility in this Class I area. The results of air monitoring in Mesa Verde National Park and Weminuche NWA showed that sulfates and nitrates (photochemically converted from SO₂ and NO_x to PM_{2.5}) contributed to roughly 50 and 6 percent of the pollutant loads, respectively, in these areas on poor visibility days in 1997 (USEPA 2002c). Visibility reducing impacts from the projected development would mainly occur from NO_x emissions, as the development would emit only small amounts of SO₂. The monitored data above imply that the potential for the conversion of NO_x emissions to visibility-reducing nitrates in the project region is low. However, the estimated NO_x emissions from Alternative B are of such magnitude, that the projected development would have the potential to form enough nitrates to significantly impact visibility in the Mesa Verde National

Park. The San Pedro Parks NWA and the Weminuche NWA in Colorado are farther away from areas of project high gas development. However, the prevalence of southwest and west winds in the region would occasionally transport emissions from Alternative B sources to these Class I areas and could substantially impact visibility in these pristine areas.

Due to the proximity of the Mesa Verde National Park to the planning area's high development area in the northwest part of the San Juan Basin, gas production emissions from Alternative B would have the highest potential to impact visibility in this Class I area. Monitoring results show that SO₂ emissions (photochemically converted to sulfates [PM_{2.5}]) contributed to roughly 50 percent of the poor visibility days in 1997 in Mesa Verde National Park and Weminuche NWA (USEPA 2002c). Visibility reducing impacts from projected development would mainly occur from the photochemical conversion of proposed NO_x emissions to nitrates (as PM_{2.5}). Nitrates contributed to 6 percent of the pollutant load on the visibility-impaired days in these 2 Class I areas in 1997. The projected development would emit only small amounts of SO₂, the pollutant most responsible for visibility degradation in nearby Class I areas. The potential for NO_x emissions to be converted to visibility-reducing nitrates in the project region is low. However, the magnitude of NO_x emissions estimated for Alternative B is high enough that they would have the potential to form enough nitrates to significantly impact visibility in the Mesa Verde National Park. The San Pedro Parks NWA and the Weminuche NWA in Colorado are farther away from areas of project high gas development. However, the prevalence of southwest and west winds in the region would occasionally transport emissions from Alternative B sources to these Class I areas and could substantially impact visibility in these pristine areas.

If any PSD major sources were proposed under Alternative B, the applicant would have to evaluate the effect of proposed emissions on visibility and pollutant deposition levels to

nearby Class I areas as part of the requirements of NMAQB Regulation 20 NMAC 2.74. However, as shown in Table 4-16, the overwhelming majority of project emissions would occur from small sources that would be exempt from these requirements unless they were accumulated as one permit unit.

Ozone Impact Assessment

Gas production activities from the projected development are estimated to substantially increase O₃ precursor emissions of VOCs and NO_x in a region that is measuring O₃ levels near the USEPA 8-hour nonattainment threshold. Review of the data in Tables 3-15 and 4-16 shows that by project year 20, VOC and NO_x emissions under Alternative B would amount to about 21 and 61 percent of the 1999 San Juan County emissions inventory. However, the actual emission increases from projected development compared to existing levels would be somewhat less, as the existing emissions inventory presented in Table 3-15 does not include existing emissions from (1) the high development area in Rio Arriba County or (2) a substantial number of natural gas-fired wellhead compressor engines that fall below the NMAQB NOI threshold of 10 tons per year. Additionally, the emissions from projected development may be overestimated in project years 1 and 20, as 50 percent of the proposed wells may not need wellhead compressors at such an early age of production, as was assumed in the annual emission calculations.

A definitive determination regarding the significance of the impact of O₃ precursor emissions from the array of gas development sources proposed under the projected development would require an intensive computerized photochemical modeling analysis, which is beyond the scope of this EIS. Criteria used to determine the significance of proposed O₃ precursor emissions therefore were obtained from the USEPA General Conformity Rule (40 CFR Part 93, Subpart B). This rule applies to proposed federal actions in nonattainment areas and previous nonattainment areas that have attained the

NAAQS (known as maintenance areas). While the planning area presently attains all NAAQS, application of criteria in the Conformity Rule to the analysis of in this RMP/EIS holds merit, given the tenuous attainment status for 8-hour O₃ levels in San Juan County. The Conformity Rule identifies annual emission *de minimis* thresholds that trigger requirements for more rigorous analyses to demonstrate that a federal action would conform to a State Implementation Plan (SIP), essentially an attainment or maintenance plan. The magnitudes of the *de minimis* thresholds vary by the severity of the nonattainment condition of a region. A maintenance area has the least restrictive thresholds and therefore is most applicable model for the project region, as the project region is in a similar situation as a maintenance area where air quality is just under the level of a NAAQS. The *de minimis* thresholds for an O₃ maintenance area are 100 tons per year of VOCs or NO_x.

Exceedance of a *de minimis* threshold is not a final statement of the significance of emissions from a federal action, as the Rule allows options for an action to demonstrate that it would conform to a SIP, and in essence, not produce significant impacts to a region. In the case of O₃, a federal action would demonstrate conformity with a SIP if its emissions (1) were already accounted for in the attainment or maintenance demonstration of a SIP, (2) were fully offset through emission reductions implemented through a federally enforceable mechanism, or (3) were included in a revised SIP.

A review of the emissions estimated for gas production from the projected development shows that Alternative B would substantially exceed the conformity *de minimis* thresholds identified for O₃ maintenance areas. Additionally, the projected development would substantially increase emissions from current levels within the planning area. As a result, emissions from projected development would be expected to increase ambient O₃ levels in the planning area by an unspecified amount. Since San Juan County is near the

nonattainment level for 8-hour O₃ concentrations, the impact of the emissions from projected development would be potentially significant to ambient O₃ levels within this portion of the project region.

OHV Use

OHV use and resulting air quality impacts under Alternative B would be similar to or less than those described under Alternative A.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 38,000 acres. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Approximately 42,000 acres of these plant communities would have the highest level of disturbance from initial construction for oil and gas development. Areas that are reseeded (13,800 acres) would not return to their original plant cover types in the 20-year period of impacts considered. Surface disturbance and vehicle travel would result in

the spread of noxious weeds that can be mitigated through implementation of a weed management plan.

Land Ownership Adjustments

Over 347,000 acres would be available for disposal and 77,600 acres for acquisition under Alternative B (Table 2-1). The dominant upland plant communities on this land are Great Basin Desert Scrub and Desert Grasslands. Much of this habitat is in close proximity to urban areas and has been degraded by human activity. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland plant communities through improved management of natural resources.

OHV Use

OHV travel in upland plant communities can result in direct plant mortality and spread of noxious weeds, and indirect effects through soil disturbance and the promotion of increased erosion. The amount of land open to OHV use under Alternative B would be 4,616 acres (Table 2-2) in SDAs. The majority of FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities. However, because the open designation would be only 0.3 percent of the FFO area, much less than under Alternative A, the impacts to vegetation from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-10).

Specially Designated Areas

Many of the areas have management prescriptions that limit vegetative disturbance, OHV access, or grazing. This management would continue to protect vegetation in a limited portion (less than 30 percent) of the FFO.

Coal Leasing Suitability Assessment

Specific locations of new coal mining areas on FFO land have not been identified. Coal mining has the potential to affect a large amount of land, depending on how many of the currently permitted sites are approved for strip mining. Applications for coal mining would go through the NEPA process and site-specific analysis of the project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 10,000 acres in 2 SDAs. There are other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from the high well numbers projected to be installed in the high development area. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the NMWQCA.

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land.

Approximately 347,500 acres of FFO land would be made available for disposal on FFO land under this alternative (Table 2-1). Designated FFO riparian areas such as the River Tracts would not be included in land

being considered for disposal. Land available for acquisition would be 77,500 acres, less under this alternative than under Alternative A. This would result in less potential for a positive impact to biological resources through the acquisition of inholdings and parcels with important biological functions.

OHV Use

OHV use of specially designated riparian areas on FFO land would be limited to designated roads and trails and intermittent wash bottoms (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in accelerated erosion and surface water runoff. The OHV traffic in dry washes would continue to degrade these areas. However, the more limited OHV access overall would, in general, provide additional protection to riparian areas and intermittent washes. Even if additional acreage were included in the "Open" category (Table 2-10) with completion of the OHV Activity Plans, none of that acreage would be in riparian areas.

Specially Designated Areas

The proposed Ephemeral Wash Riparian Area on 7,459 acres of public land would provide additional protection to these important areas within the FFO. There would be more emphasis on acquiring inholdings within the River Tracts Riparian Area than there would be under Alternative A, which would provide additional protection to those riparian areas by applying the more stringent management prescriptions, as identified in Table 2-5. CSU constraints in over 236,000 acres in SDAs under Alternative B would assist managers in avoiding riparian and wetland areas because oil and gas operations can be moved in order to minimize impacts to riparian areas and wetlands.

Coal Leasing Suitability Assessment

Coal mining operations would not take place in significant wetland and riparian habitat because these areas would be screened out through application of the unsuitability criteria. There is the potential that coal mining could

lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately addressed.

Special Status Species

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur on federal land in the planning area, as well as for other special status species. The species, critical habitats, and protective measures are listed under Alternative A, Special Status Species.

Oil and Gas Leasing and Development

Implementation of Alternative B would be expected to affect the same special status species as Alternative A. Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described in previous sections. The FFO would reinitiate consultation as necessary to ensure compliance with ESA.

Land Ownership Adjustments

The amount of land that would be made available for disposal in the tri-cities area is greater under this alternative than under the other alternatives, and typically consists of

degraded habitat in close proximity to human activity and is therefore considered marginal habitat. No federally listed or proposed species or their critical habitat are known to occur in land being considered for transfer to local municipalities.

The FFO would retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and that is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

The amount of land open to OHV use under Alternative B would be 4,616 acres within SDAs. The majority of FFO land would be closed or limited for OHV use. Because the open designation would be only 0.3 percent of the FFO area, much less than under Alternative A, the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-10) as the OHV Activity Plans are completed. It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys, placed on the conflict map maintained at the FFO, and OHV travel is restricted through the appropriate process and environmental document.

Specially Designated Areas

The Aztec Gilia ACEC would be eliminated under this alternative because this plant is much more widespread on FFO land than originally thought, and the habitat within the ACEC is not representative of optimum Aztec gilia habitat. This would not negatively impact the Aztec gilia because the protective measures described under Alternative A would be required.

The Bald Eagle ACEC would be maintained to protect nesting and use sites from disturbance. An Ephemeral Wash Riparian

Area would be created under Alternative B, which would include the ephemeral wash riparian reaches and wetlands designated in the Riparian EIS (BLM 2000c), including over 7,400 acres. The proposed Riparian Area would provide protection for potential southwestern willow flycatcher habitat, as well as for wildlife habitat in general.

The Mexican Spotted Owl ACEC would be established for the protection of the federally designated critical habitat. Within the boundaries of this ACEC, the management prescriptions would follow the requirements of the Recovery Plan, including the prohibition of cutting of ponderosa pine and Douglas fir, and limits on oil and gas development in the mixed conifer forest.

Coal Leasing Suitability Assessment

Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and additional coal interests. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on Map 4-1. Many of the PRLAs, competitive lease tracts, and additional coal interest areas, occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to

mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act, so it is anticipated that mitigation measures would be required to minimize impacts.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of Alternative B would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 3,653 wells would be developed in the 397,000 acres of public land in wildlife areas in the high development areas under Alternative B. The construction of these wells and associated roads and pipelines would result in the long-term loss of about 11,500 acres of habitat (Table 4-6). The long-term loss of habitat from existing and projected development would be about 30,500 acres or 7.7 percent of the area. An estimated 296 miles of new roads would be constructed, which would result in an increased road density from 2.6 to 3.1 mi/mi². Habitat fragmentation from the new roads cannot be determined at this time, but the potential decrease in functional habitat within 660 feet of roads could be as much as 47,000 acres. Within 1,320 feet, it could be 95,700 acres. This represents an increase from 46 to 55 percent functional habitat loss within 660 feet and from 75 to 93 percent within 1,320 feet of roads. This is likely to be an overestimation because of the overlap in those areas. These losses would further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife.

A total of 382 wells would be developed in pronghorn antelope habitat in the Ensenada Mesa area. The estimated amount of long-term disturbance from these new wells, roads, and pipelines, would be about 1,200 acres or 3 percent of the total area. About 31 miles of roads would be constructed, resulting in an increase in road density from 3.8 mi/mi²

currently to 4.2 mi/mi². Functional habitat loss could increase by as much as 6,080 acres (14 percent of the total Angel Peak Wildlife Area) for the 660-foot effects zone, and 12,160 acres (28 percent) for the 1,320-foot road effects zone. This may be an overestimation of this increase due to new roads overlapping existing roads. The increase in habitat disturbance, roads, functional habitat loss, fragmentation, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A.

Other species of wildlife would also be affected by oil and gas development, including the displacement of breeding birds. The loss of 11,500 acres of land in the 523,700-acre study area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the Mixed Coniferous Woodland and Great Basin Desert Scrub habitat, which would not be replaced within the 20-year period of analysis.

Under Alternative B, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 28 acres on the SFNF, 340 acres on USBR land, and 2,500 acres on AFO land. Many of the same species that were assessed above on FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower numbers of projected wells and roads, resulting in lower levels of habitat fragmentation.

Land Ownership Adjustments

The amount of additional land that would be made available for disposal in the tri-cities area under this alternative would be more than under the other alternatives. Within a three-mile buffer of the tri-cities area, implementation of this alternative would have the potential to affect some relatively undisturbed habitat as well as the more degraded areas that occur nearer human habitation. Wildlife species associated with the Great Basin Desert Scrub and Desert Grassland plant communities would

be affected if the land use and management change under the new owner.

OHV Use

The potential impacts of OHV activities would be the less than under Alternative A because the access would be more limited.

Specially Designated Areas

The Critical Big Game Habitat areas would be continued with their timing limitations to protect wintering deer, elk, antelope, and turkeys. Thomas Canyon would be enlarged, and both Carracas Mesa and Thomas Canyon would be managed for wildlife as well as recreational value, resulting in an additional 16,000 acres of public land with a goal of wildlife habitat management.

Coal Leasing Suitability Assessment

Specific new coal lease areas have not been identified. The coal extraction program on FFO has the potential to affect a large amount of land. Proposed coal operations would go through the NEPA process and an analysis of the proposed project on wildlife would be performed at that time.

Wilderness

Oil and Gas Leasing and Development

The level of new oil and gas development in areas surrounding the WA and WSAs would be slightly higher than current levels, but could be more than would occur under Alternative A. The nature of the potential indirect impacts would be similar but to a slightly greater degree than under Alternative A. However, under this alternative, the FFO would pursue acquisition of adjacent lands, increasing the manageability of wilderness land. Acquiring additional land around the WAs would enhance management of the surrounding areas in a manner that is compatible with wilderness.

Noise from new compressor sites or well locations could affect peripheral areas of the WA and WSA. To reduce these potential indirect effects, conditions could be applied to

new oil and gas development on lands adjacent to the WA and WSA to preserve wilderness qualities, providing protection of natural quiet along the periphery of the protected areas.

Land Ownership Adjustments

Acquisition of land surrounding the WA and WSAs would reinforce wilderness values and provide for compatible use of lands adjacent to WAs. Other adjustments would be the same as Alternative A.

OHV Use

There would be no change in OHV designations that close the WA and WSA to OHV use.

Specially Designated Areas

Designating Ah-shi-sle-pah WSA as an ACEC would provide legislative protection for special resource values and allow for additional control of productive uses regardless of its future wilderness status.

Coal Leasing Suitability Assessment

Potential coal development in the vicinity of Bisti/De-na-zin WA and in or around Ah-shi-sle-pah WSA would have similar impacts as described for Alternative A. Indirect impacts such as visual, air quality, or sound quality could affect adjacent WA and WSA areas. Application of the coal unsuitability criteria would prevent direct impacts of coal development in WAs and WSAs.

Rangeland

Oil and Gas Leasing and Development

Due to the high numbers of projected wells and associated infrastructure that would be constructed under Alternative B, there would be more impacts on rangeland and livestock grazing due to surface disturbance and fragmentation of grazing allotments than under the other alternatives. Impacts would result from the reduction of the acreage of forage available for grazing through surface disturbance, construction of oil and gas facilities, and the increased potential for

spreading weeds from more facilities and more travel between them. There would also be more potential for conflicts with oil and gas operations, as described for Alternative A.

Land Ownership Adjustments

There would be 28 grazing allotments within the area identified for disposal under this alternative that extends three miles from the tri-cities area municipal boundaries. All or part of the following range allotments would be affected by land disposal in this area: 5004, 5005, 5006, 5007, 5009, 5010, 5016, 5018, 5019, 5025, 5028, 5030, 5031, 5032, 5033, 5035, 5037, 5047, 5070, 5072, 5127, 5128, 5140, 5144, 5145, 5146, 5147, 5150.

According to FFO staff (Sanchez 2001), when urban areas extend their boundaries into range allotments, conflicts between adjacent land users arise, especially regarding control of livestock through fencing. FFO policy corresponds with state policy that fencing should be constructed to exclude livestock from an area. However, county and municipal regulations often only require that animals be controlled by their owners. If the local fencing requirements became applicable to permittees grazing cattle or horses near the urban areas, there would be a potential economic impact resulting from the cost of erecting fences to contain livestock. If the cost of fencing is prohibitive, this could result in permittees giving up their allotments or transferring them to sheep farmers who would use herders to control their livestock.

OHV Use

There would be fewer conflicts between grazing permittees and OHV users, as described in Alternative A, because OHV access would be much more limited than under Alternative A. There would also be fewer opportunities for noxious weeds to be spread by cross-country OHV travel, so weed management problems would be reduced. Even if additional acreage were opened to OHV use as the OHV Activity Plans are completed, conflicts with grazing permittees would be a major consideration in the designation of those open areas.

Specially Designated Areas

Grazing limitations identified in 22 of the SDAs under Alternative B include approximately 8,000 acres that would be closed to grazing, almost 1,000 acres in three areas in which grazing permits would not be reissued if they expire, and 7 acres that would be withdrawn from grazing in these areas. All of these limitations are proposed for public land, and all but the acreage that would not be reissued are currently in effect, so few new impacts on grazing would result.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Oil and Gas Leasing and Development

About 24,800 acres of land within the FFO would be disturbed over the next 20 years for new oil and gas facilities. About half this disturbance would be for new pipelines and would occur in existing utility and transportation corridors to the extent feasible. These actions would displace existing use on less than 2 percent of the land overlying federal minerals estate in the FFO. This would have little overall effect on multiple use objectives. Specific effects on multiple uses and natural resource values are discussed under their respective resource sections. Use of non-federal land could also be displaced, or conditions altered, from new oil and gas facilities. BLM would coordinate with surface owners to minimize potential incompatible development, but suitable uses of some areas may be altered.

There would be up to 320 large compressors (over 500 to 10,000 HP) and about 14,000 smaller compressors (about 100 HP) installed at new and existing well sites throughout the oil and gas region. Potential impacts from these noise sources on adjacent uses, such as residences, community facilities, other noise sensitive uses or receptors, would be reviewed on a case-by-case basis. Suitable

methods to reduce noise may be incorporated into COAs. However, there are likely to be incompatible adjacent uses in locations throughout the area. Impacts during construction (such as localized noise, dust, and emissions) would be more frequent than under Alternative A, and may be inconvenient and incompatible with some ongoing uses, but would be temporary.

Under Alternative B, about 1,100 miles of new roadway may be constructed as a result of oil and gas development. About 650 miles may be reclaimed resulting in a net increase of about 3 percent over the existing network. Under the new roads program, maintenance of new industry service roads would primarily be borne by industry users. Industry-related traffic is estimated to increase by about 8 to 30 percent from federal oil and gas production and 11 to 22 percent in the planning area over current levels. This would likely generate moderate to significant increases on specific roadways, but it is not known to what degree it would affect traffic flow. Traffic, largely by heavier trucks, is expected to increase the amount of maintenance needed to keep some roads functional. This would be particularly problematic on roads that are currently in poor condition. The road inventory will evaluate existing road condition and capacity for additional traffic. Other access and road-related actions would have similar effects as described for Alternative A.

The creation of new roads, although relatively small proportionately, would exacerbate existing problems that are attributed to the proliferation of roads. With respect to land use compatibility, expanded road access would continue to extend human activity into areas that remain natural at the present time.

Land Ownership Adjustments

In addition to the land adjustments described for Alternative A, disposal of about 347,500 acres in the FFO, including 71,250 acres of BLM land within a 3-mile distance of the tri-cities area corporate boundaries, would be a priority for the FFO. BLM lands within

existing or proposed SDAs would not be available for disposal, minimizing potential loss of areas with special value. Throughout the FFO, split estate could increase by about 329,300 acres, or about 44 percent over current levels. Most likely, land near the tri-cities area would be leased and patented under various appropriate R&PP Act applications. These transactions would need to be consistent with BLM objectives and stated community needs and goals. Implementation of R&PP disposals would be facilitated by clear community plans for development on disposal parcels. Sales at fair market value may also be executed. The 71,250 acres could increase the non-federal land supply by over 50 percent in the tri-cities area, providing opportunities for community expansion and growth. However, all this land would likely become split estate. The types of suitable uses on split estate lands may be limited by the possibility of incompatible oil and gas development. Future development in these areas would be guided by applicable zoning or subdivision regulations. Potential conflicts between grazing operations on FFO land and adjacent private land could increase if fencing issues are not considered, particularly in disposal actions (see Rangeland).

OHV Use

The default classification of BLM lands in the FFO as limited to cross-country travel could improve conflicts between some OHV uses (such as four-wheeling and motocross) in the vicinity of residences, particularly closer to developed areas. Also, potential for cross-country travel on private land that is accessible due to public easement along many roads would be reduced. Development of Activity Plans for 13 OHV units would be coordinated with future transportation plans to provide for recreational use of designated trails and areas into the future.

Specially Designated Areas

BLM would acquire 77,589 acres of non-federal inholdings under this alternative, reflecting proposed adjustments in boundaries of SDAs. The effects of acquisitions and

disposals would be similar to Alternative A. Accounting for proposed acquisitions, specially managed land could increase by 11 percent over current conditions.

Coal Leasing Suitability Assessment

Several coal leases could be developed under this alternative, including expansion of the San Juan mine and coal interests in the Lee Ranch/Hospah area. Further NEPA analysis would address potential impacts to adjacent non-federal lands as proposal for specific parcels are identified. The San Juan mine is comprised of multiple leases. The existing mining operations and power plant dominate the nearby landscape. Expansion would be consistent with this highly modified industrial area. Residential uses have also developed nearby along Highway 64, likely due to availability of infrastructure, lower land and development costs, and proximity to employment areas. Impacts on nearby residential areas would need to be addressed when expansion areas are defined. Development of any new mine, whether on federal or non-federal land, would also require further environmental analysis. Potential impacts on surrounding land uses would be addressed. A likely location would be the Lee Ranch/Hospah area. The area is generally isolated with very low population. The FFO has no SDAs in this location. The 1870s Wagon Road Trail passes through some of the identified coal interests and lease tracts. A large new surface mine in this area may be visible from sensitive locations (such as cultural sites) for fairly long distances. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

The level of oil and gas development on federal minerals under Alternative B would be considerably higher than under Alternative A. About 13,300 new wells are projected on land overlying federal minerals with 7,170 at new

locations and about 4,400 wells (and associated unused roads) would be reclaimed. The average well density would increase from the current 2.6 wells per square mile to 2.9 wells per square mile in the high development area by the end of the 20-year period of analysis. Considering existing and future development on both federal and non-federal land, well density could increase in the high development area from 2.6 to 3.1 wells per square mile in the high development area. This would increase the overall presence of oil and gas development by about 20 percent over current levels. This would cause noticeable changes to the visual landscape and likely contribute to downgrading of VRM conditions on a regional basis.

About 11,100 wells are projected for land with federal minerals in the FFO area. Accounting for reclamation, an estimated 24,800 acres would be disturbed. However, because of NSO leasing stipulations in some of the VRM Class I and II areas, some wells could not be drilled within these SDAs. Therefore, the potential for degradation of visual conditions on the periphery of these areas is high. Enforcement of VRM standards would reduce the effects of development on valued visual resources.

Over 140 projected new wells (on 80 new sites) on USBR land would add to the density of manmade alterations in the landscape. Required setbacks from shoreline and recreational sites would minimize the intensity of visual impacts. Maintaining VRM Class II objectives may be difficult if all projected wells are permitted. About 700 new wells (involving about 400 new locations) may be drilled in USFS areas (primarily in the Jicarilla Ranger District). USFS policies would favor oil and gas production and would allow above-ground pipelines and new roads to be constructed, increasing the potential for visible modifications. Under this alternative, the impact of manmade modifications in the landscape would become more evident and visual conditions would decline.

Land Ownership Adjustments

The emphasis on land disposal under this alternative would put additional land at risk for future development without VRM constraints throughout the FFO area. Similar impacts from development on non-federal lands as described for Alternative A would also apply. In the tri-cities area, 26,600 acres of BLM land would be high priority for disposal. None of the 10 SDAs within the tri-cities area disposal area have VRM Class I or II rating; therefore, the overall sensitivity of these areas to any future changes is relatively low.

OHV Use

Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation that can be caused by off-road travel. This would limit potential visual impacts in the FFO on a widespread basis and benefit visual resources. As the OHV Activity Plans are completed, any new OHV open areas would be analyzed for their effect on the landscape and would have to meet the VRM category designation.

Specially Designated Areas

Management of FFO lands for VRM objectives under this alternative would be similar to Alternative A. However, expansion of some SDAs would increase the amount of land managed for VRM Class I and II classifications to about 13 percent of the FFO area. This is a slight increase over current conditions. This would have a minimal minor benefit on visual resources.

Overall, considerable impacts could result to visual resources on federal lands under this alternative, primarily due to increases in oil and gas infrastructure, and, to a lesser degree, from some permitted and incidental cross-country OHV use. With the enforcement of VRM objectives, impacts can be avoided in the most sensitive and valued areas.

Coal Leasing Suitability Assessment

Potential impacts of Alternative B to visual resources would be similar to Alternative A.

Any large new surface mining operation could cause considerable change in nearby areas, and be visible for great distances. This could affect the visual quality of the proposed Piñon Mesa Trail Recreation Area and could expose travelers along nearby roadways to increased visual impacts. Development of coal interests in the Lee Ranch/Hospah area could affect viewsheds of sensitive cultural resources. The surrounding area is particularly rich in Chacoan sites, including the Chaco Culture National Historic Park.

Cultural Resources

All impacts to cultural resources described in this section include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

The higher projected surface disturbance under this alternative would potentially affect 2,211 archaeological sites (Table 4-10). As under Alternative A, archaeological sites in the Largo, Carrizo, La Plata, and Upper San Juan watersheds would be most affected by this alternative. Site quantities in the Largo watershed may be underestimated.

This alternative would result in an increase of almost 1,100 miles of new roads (Table 2-3) in the high development area, which would greatly increase public access to archaeological sites and TCPs. An increase in vandalism would be anticipated due to increased public access.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under

Alternative A for archaeological sites to be damaged by vehicles driving across the landscape. If additional acreage were designated as open to OHV use (Table 2-10) as the Activity Plans are completed, cultural resources would be considered during planning and inventory.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, grazing, and OHV activities would be provided to important cultural sites in 86 SDAs that are either SMAs or ACECs within approximately 40,400 acres in the FFO area. All of these areas would be designated as noise sensitive. Proposed management prescriptions would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use.

Ground subsidence has already been documented in the vicinity of the Deep Lease coal mine in the northwestern part of the FFO area, identified as BHP Additional Coal Interest on Map 2-8. Additional monitoring in this area would be needed as deep coal mining continues, in order to identify and mitigate impacts to cultural resources.

Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative B would involve the most acreage of surface disturbance and have the greatest potential for impacts to paleontological resources due to the highest projected well numbers. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

There would be no impact to known paleontological resources from land disposal because the resources would be surveyed prior to land transfers and important paleontological resources would not be available for disposal. If inholdings within 4 existing and 5 proposed SDAs were acquired, more paleontological resources would be protected through implementation of management prescriptions than under Alternative A.

OHV Use

The limited OHV designation in most of the FFO area would greatly reduce cross-country travel and the resulting damage to slopes, soils, and vegetation that could affect paleontological formations through directly destroying surface fossils, wearing down rock formations, or accelerated soil erosion. By eliminating areas with shallow bedrock from consideration for open OHV designation in the future (Table 2-10), impacts to paleontological formations would be avoided. Designation of additional acreage in the “Open” category as the OHV Activity Plans are completed should have little effect on paleontological resources since the most important of these are protected within SDAs.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public

land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal mining. Consequently, there could be the potential for additional impacts if additional coal mining were to be approved in areas where unidentified paleontological resources occur.

Recreation

Oil and Gas Leasing and Development

Under this alternative, development of 11,100 new oil and gas wells in the FFO area could cause a net displacement of 1.8 percent of the FFO lands that are open to the public for recreation. All of this land is within the high development area in the northeast half of the planning area. This should have minimal effect on the availability of dispersed recreation throughout the FFO area.

Some stipulations on oil and gas development in areas specially managed for recreation would be changed. Relatively more recreation land would have NSO restrictions. This stipulation would prevent oil and gas development directly on a larger portion of special recreation areas. The existing 409 wells in these areas would increase by about 427 new wells, almost doubling the amount of associated infrastructure, vehicular traffic, noise, and visual modification. They would cause minor displacement of recreational use on about 2.4 percent of the recreation areas and somewhat increase road density and oil-and-

gas-related traffic over current levels. Accounting for wells that would be plugged and abandoned, the average well density in recreation areas would increase by about 105 percent. Excluding the areas specially developed for OHV use, this is likely, over time, to degrade the quality of opportunities for outdoor recreational activities that enjoy quiet and natural surroundings.

It is expected that about half the new wells within recreation areas would have compressors that generate noise. Noise could become more prevalent and scattered throughout these areas, as well as the rest of the highly productive oil and gas area. Conflicts between noise sensitive uses would be addressed and mitigated on a case-by-case basis. Because of existing stipulations and protective laws, the WA and WSAs would be relatively unaffected by oil and gas and motorized vehicle use. Along the periphery of these areas, there may be indirect effects from changes in visual quality and incidental noise sources from activities on adjacent lands.

About 320 larger (500 to 10,000 HP) compressors and about 14,000 small well-site compressors would also be sited throughout the oil and gas areas. Noise reduction measures may be required for some sites near residences and some developed recreation sites, but many would not be mitigated on the current case-by-case basis. Consequently, noise generated by these facilities could be incompatible with quiet outdoor activities in some locations.

Impacts on recreation to AFO land would be similar to Alternative A. There would be about 1,300 new wells on AFO lands, but based on resource potential, very few in the recreation areas. There may be localized effects on dispersed recreation, primarily from visual alterations and compressor noise.

Under this alternative, the areas around Navajo Lake would have a CSU stipulation. The number of new wells around the lake could increase from 128 to 290 (half expected to have compressors) over the next 20 years. Controlled surface use stipulations and VRM II classification allow for more careful siting of

new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. The number of new noise sources could have impacts on recreational uses if not reduced through site modifications. Wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas. However, new development would likely be noticeable to recreationists, as are existing facilities.

About 700 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District. This level of development would more than double traffic on some forest roads, add over 50 miles of new roadway, and introduce new noise sources from compressors to areas where people undertake dispersed recreational activities. A variety of current management practices would be relaxed to facilitate development that would contribute to less desirable conditions for quality dispersed outdoor recreation. Road densities could increase over 0.5 mi/mi², the established planning objective for the Jicarilla Ranger District, requiring amendments to the existing Forest Plan. Increased evidence of human activities (sight, sound, and disturbance) over current levels would degrade conditions for a variety of outdoor recreational pursuits in natural settings. Increased erosion, sedimentation, and habitat fragmentation resulting from increased road density would indirectly affect wildlife, vegetation, and visual quality desired for quality dispersed outdoor recreation. Specific recreation sites may be affected by visual and audible intrusions of oil and gas facilities if not mitigated by siting and other physical methods.

Similarly, about 160 new wells around Navajo Lake could affect the visual quality and sound levels around the primary recreation sites such as Pine River Recreation Emphasis Area, Sims Mesa Recreation Emphasis Area, and San Juan River Management Area. Use of noise-reducing methods could minimize some of the audible impacts.

Overall, changes in visitation levels for recreational activities are difficult to predict, but visitor satisfaction would likely decline as scenic and acoustic quality declined in popular and remote recreation areas throughout federal land under this alternative.

Land Ownership Adjustments

Under a management framework of maximizing productive use and access, lands would be more easily available by sale and under the R&PP Act. An area around the tri-cities area of 71,250 acres would be available for disposal. This could mitigate the shortage of land for development in the urbanizing tri-cities area. Established or proposed recreation areas that are near the tri-cities area would not be available for disposal unless proposals include plans for recreational uses. Disposal and development of favored recreation areas would be detrimental to recreational opportunities unless this is the proposed use of the receiving entity. BLM would review all proposals for consistency with BLM objectives, compatibility with adjacent public land uses, and public purposes. Preferably, these would be documented in planning documents or well-supported in community involvement initiatives. Acquisition of inholdings in recreation areas would improve management and access for recreation.

OHV Use

Expansion of the OHV management units to cover the entire resource area under a default “limited” classification would dramatically alter potential for cross-country travel. There would continue to be fairly lenient provisions for exceptions and certain uses (such as residents, emergency access, permit holders) that would allow for some travel off roads in “limited” areas. Also, as OHV Activity Plans for each unit are developed, public input would be used to further define areas that may be suitable for cross-country travel. A preliminary screening identified about 100,000 acres of BLM land that may be suitable for OHV and cross-country use in addition to SDAs comprised of 4,616 acres. The advantage of

this approach is that particularly suitable areas could be used for cross-country sports, and potential damage to areas with other resources values would be reduced.

Considering the extensive road network in the oil and gas development area, access by the public for most purposes and to most areas (either productive or recreational), would remain high. This alternative would provide added protection for natural and cultural resources, and provide benefits for some recreationists that prefer opportunities for quiet and natural experiences.

Under this alternative, the trail system would be expanded by almost 300 percent with 94 miles of new trails. Trails would greatly augment appropriate recreational facilities for both motorized and unmotorized vehicle use. The proposed trails would be located close to the larger population centers, providing ready access. More trails could be identified during preparation of the OHV Activity Plans.

Specially Designated Areas

As shown in Table 4-13, the amount of land specially managed for recreation would decline slightly (due to reducing the size of the GRTS area). While this is not significant in quantity, four popular areas in proximity to the tri-cities area would become recreation areas: Alien Run Mountain Bike Trail, Piñon Mesa Trail, Rock Garden, and Navajo Lake Horse Trails. These new areas would respond to the need and demand for additional and segregated trails for motorized and unmotorized vehicles and horseback riding. This would have a beneficial effect on recreational opportunities in the FFO area. ROS classifications shown in Table 4-12 would apply to about 32,000 additional acres, providing a standard for maintaining a mix of recreational opportunity and for managing road density and other development in these areas.

In addition to changes in stipulations on oil and gas development, changes in management prescriptions would generally be applied to protect a range of resource values that would indirectly benefit recreation. Examples include

restrictions on shooting in developed sites, reclamation efforts using native plant species, a policy of no land disposals within SDAs, clearances for surface disturbing activities, and case-by-case review of new ROWs. Renaming three recreation areas would provide more informative description of their resource value for recreationists. This would be particularly useful for out-of-region visitors.

Coal Leasing Suitability Assessment

Development of coal leases, PRLAs, and coal interests has the most potential to affect dispersed recreation in the remote badland areas around Bisti/De-na-zin WA and Ah-shi-sle-pah WSA. Development around the WSA, whether designated or not, could indirectly influence exceptional landscape qualities for persons recreating in that area.

Development of the San Juan mine could expand the immediate area affected by mining operations. Areas surrounding Farmington are used for a variety of recreational activities. Changes in visual and sound quality from expanded coal operations could affect the quality of recreational experiences west of Farmington. If the San Juan mine expanded into this proposed area, no underground mining or development of other leasables and salables along the Piñon Mesa Trail Corridor would be permitted.

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 13,275 new wells projected under Alternative B, and 14,400 existing wells on land with federal minerals, this could result in almost 14,000 small wellhead compressors scattered throughout the high development area. Noise from the wellhead compressors from mechanical parts and exhaust ranges from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 300 mid-size compressors (500 to 2,000 HP) would be installed under Alternative B. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be much greater than under Alternative A because there would be 4,400 more small compressors and 174 more large compressors in use over the 20-year period. These would continue to be mitigated on a case-by-case basis.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

OHV Use

Limiting OHV use to designated roads and trails could lessen noise in remote areas. Many more maintained roads would be constructed in the high development area and used by OHVs. This would contribute to intermittent traffic noise in the immediate surrounding area for the

long-term. Development of OHV Activity Plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Social and Economic Conditions

Employment

Under this alternative, based on a total of 13,275 new wells and reclamation of 4,398 wells per year over the next 20 years, there would be an increase of about 1,020 development jobs per year in the planning area over current levels employed in oil- and gas-related jobs. There would also be a gain in annual maintenance jobs (about 1,300) after 20 years, resulting in a 20 percent increase in oil and gas employment on federal land after 20 years. This would have a positive impact on local oil and gas industry employment and earnings in the planning area, and minimal impact overall for the region. However, industry jobs would still be subject to boom-bust cycles due to market-driven demands.

Under this alternative, coal mining jobs associated with federal minerals would not be expected to decline with expansion of existing mines and possible new operations on competitive lease tracts, recent coal interests, and PRLAs. If several new locations become productive, this could result in substantial job increases for the coal industry, but fairly minor increases for the region. There is a shortage of experienced underground miners, so this type of operation would likely draw from other states.

Expenditures

Under Alternative B, the estimated cost for drilling 13,275 wells is almost \$7.2 billion, at an average cost of \$541,000 per well. No commingling of wells was assumed for this alternative. These costs assume about 110 directional wells, or approximately 1 percent of the total number of projected wells, for this alternative. Additional direct costs would increase the total investment to almost \$8.1 billion. Additional indirect expenditures could

result in a total of \$10.3 billion spent over 20 years or an average of \$517 million per year (non escalated). This represents a threefold increase in expenditures for federal oil and gas development compared to Alternative A, and over 20 percent increase above current expenditures. This alternative would provide the greatest influx of expenditures into the local and regional economies and somewhat outpace the estimated expenditures if current development were continued.

Revenues

Under Alternative B, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,158 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of \$3.00 per Mcf, the total value of this product could be about \$33.5 billion (in 2001 dollars). The volume of production each year would slowly increase, more than doubling current levels in 20 years. Therefore, potential effects on tax revenues would be significant from increasing production. Other factors, primarily product value and tax rates, would be far more influential in future tax revenue potential.

Under this alternative, additional coal leasing could be pursued. However, a recent industry study of coal production indicates that overall production from mines on federal land in the Four Corners area is not expected to increase over the next 20 years. Some mines are likely to lose production while others increase or expand. Therefore, overall production and value of coal are not expected to change significantly. Expansion of the San Juan Basin mine, and development of federal minerals on the coal lease tracts rather than non-federal minerals, would benefit total federal royalties paid to the State of New Mexico. Additional development could extend the lifespan of coal resources in the basin.

Grazing may be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw

grazing. Under this alternative, about 2 to 3 percent of the FFO land would no longer be available for grazing. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. This may slightly reduce the amount of permitted AUMs and therefore the amount paid to the FFO. Slightly reduced cattle numbers would lower the total productive value in the FFO by about 2 to 3 percent under current levels. Although the value is small in relative terms, the marginal viability of cattle ranching and potential loss of lifestyle values would remain of concern. The potential impact to local and regional cattle ranching under this alternative would be minimal.

Environmental Justice

Effects on minorities and low-income populations would be essentially the same as under Alternative A. Effects of compression noise may be widespread and could be incompatible with adjacent uses, especially near communities or homes. Tribal entities and BIA would review APDs on tribal surface land and contribute to COAs to reduce impacts of new oil and gas facilities. Increases in oil and gas-related jobs could provide some benefit for the local labor pool particularly in Rio Arriba. McKinley County would benefit economically from development of a new mine in the Lee Ranch/Hospah area, but no specific proposals are identified at this time.

ALTERNATIVE C—RESOURCE CONSERVATION

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 18,197 acres under Alternative C. Surface disturbance associated with large pipelines would be 11,559 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,680 acres for Alternative C. There would be an additional 10,200 acres of initial short-term surface disturbance that would be revegetated after construction.

Subtracting reclaimed acreage of 13,194, the net amount of long-term surface disturbance under this alternative would be 18,238 acres (Table 4-1). This does not include plugged and abandoned wells already awaiting approval for reclamation.

Watersheds

Under Alternative C, initial short-term surface disturbance is estimated to total almost 31,500 acres (Table 4-2) due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 173 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between

1 and 13 percent of those watersheds. The total increase would be approximately 797 miles in the planning area (Table 4-3). This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest percentage of unpaved roads and bare ground from construction of new wells, pipelines, and roads.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative C assumes that commingling and dual completions would be common. The number of completions allowed to extract federal minerals under this alternative would be 9,836 after consideration of surface stipulations that would eliminate access to 134 wells. NSO restrictions would require 195 directional wells (2 percent of all wells on federal minerals) to be drilled to access reservoirs under SDAs and USBR land. There would be 114,100 acres closed to new leasing.

There would be a NSO restriction placed on all of the USBR land that would eliminate access to 102 wells and limit resource extraction to 64 directional wells drilled outside of the USBR boundary. Spacing and density rules would determine the actual number that could be developed.

The implementation of the proposed Noise Policy would add restrictions and additional mitigation requirements to gas wells in or near

NSAs, but would not affect extraction of the mineral resources.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative C than Alternative A, but fewer than under Alternative B. These quarries would be approved with the APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under current management 338,067 acres of public land would be available for disposal, of which approximately 304,450 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under any other alternative because the disposal area would be limited to Crouch Mesa in the tri-cities area.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitation imposed on the management of resources within their boundaries in the FFO. Due to NSO constraints within SDAs in the FFO, there would be 32 wells that would not be developed and 131 wells that could be developed if directional drilling were used. With more acreage within

SDAs, there would be more limitations on mineral extraction operations and leasing than under the other alternatives.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

There would be fewer potential conflicts for mineral extraction under this alternative because fewer areas would be considered for coal mining, by limiting the PRLAs to those outside the Ah-shi-sle-pah WSA and by not considering the Additional Coal Interest areas for new mining. The total number of oil and gas wells approved over the next 20 years would be lower under this alternative than all but Alternative A, and there would be more restrictions on mineral leasing within SDAs.

The areas identified as suitable for coal development after application of most of the unsuitability criteria (378,275 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternative A, but less than Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 31,500 acres (Table 4-2). When accounting for the reclamation of P&A wells, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be 17,000 acres more than under Alternative A. The

resulting impacts to soils would be an increase in soil erosion, but the amount of erosion would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to more construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area.

OHV Use

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion, through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because OHV traffic would increase soil compaction and further reduce any existing vegetative cover, and prevent its reestablishment. Because additional open designations would not be made under Alternative C, this alternative would result in the fewest impacts to soils from OHV use.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. Most of this watershed is moderately susceptible to water erosion, high salinity, and has low susceptibility to wind erosion, which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are

preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative C, new oil and gas development would result in a net increase in surface disturbance of about 18,200 acres. Water required for the drilling operations would amount to approximately 6,925 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the direct impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the increased acreage of initial surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The smaller disposal area in the vicinity of the tri-cities area that would be considered for development could result a lower potential for an increase in water use in the region than

under Alternative B, but possibly more than Alternative A, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative C are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative C and no additional open designations would be considered, potential impacts to water resources would be less than under all other alternatives. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

Alternative C contains the highest acreage of SDAs (713,710) and the most restrictive management prescriptions for surface disturbing activities. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, and a resulting minimization of sedimentation. This protection would be provided in 49 percent of all the public land in the FFO area.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt

revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative C proposes to develop 9,836 new gas wells on federal lands, which would produce approximately 10,840 Bscf of gas over a 20-year period. This production rate is slightly less than production estimated for Alternative B. Emissions from gas production for Alternative C were estimated by the same methods used to estimate emissions for Alternative B, which focused on the number of proposed wells. This approach was taken, as it is believed that the number of wells and their associated compression demands influence emissions from this activity more than production amounts. Annual emissions and resulting ambient air quality impacts from gas production under Alternative C therefore would be about 72 percent of those estimated for Alternative B. However, it is possible that isolated cases of near-field ambient impacts could approximate those estimated for Alternative B in areas of high-density well development. Appendix J includes the emissions estimates for Alternative C.

OHV Use

A policy that limits vehicular use to designated open areas, maintained roads, and designated trails would reduce the amount of ground disturbance in the planning area. This would reduce the potential for fugitive dust emissions and wind-blown dust. As a result, OHV use and resulting air quality impacts under Alternative C would be less than under Alternatives A or B.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 31,400 acres. Initial surface and vegetation disturbance during construction would affect an additional 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period of impacts under consideration, resulting in direct impacts to vegetation.

Surface disturbance promotes the germination of noxious weeds, and equipment that travels from well to well would spread weeds. This would result in the proliferation of weeds that compete with native vegetation unless mitigated through implementation of a weed management plan. Revegetating disturbed areas with the appropriate native plants would benefit the upland vegetation plant communities.

Land Ownership Adjustments

Approximately 338,000 acres of land would be available for possible disposal under

Alternative C. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative A. An estimated 190,000 acres would be available for acquisition (Table 2-1), more than would be available under Alternatives A and B. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B through implementation of vegetative management practices and a weed management plan on more acreage in the FFO. This has the potential to have a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized.

OHV Use

All FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed. Cross-country travel would not be allowed except under certain limited circumstances on 4,616 acres of public land in the FFO (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B (Table 2-2), and OHV use of 2-track roads or trails would only be allowed in designated areas. The potential for OHV traffic to degrade upland plant community types and spread weeds would be less than under the other alternatives.

Specially Designated Areas

There would be additional limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within SDAs under Alternative C. There would be more acreage within these areas than under any other alternative, so the limitations on land use, such as vegetation-disturbing activities, OHV access, or grazing, would be applied to more public land within the FFO area than under the other alternatives. If inholdings are acquired, implementation of weed management plans would be more

successful on land with contiguous federal ownership.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

Approximately 2,500 acres of public lands along the San Juan, Animas, and La Plata Rivers would be protected by CSU constraints outlined in the River Tracts Riparian Area. In addition, the FFO proposes to establish the Ephemeral Wash Riparian Plan to ensure that development does not occur in active flood plains, and to develop mitigation measures for all new disturbance within 100-year floodplains of designated riparian areas. Mitigation would focus on, but is not limited to, restoration of wash channels by construction of sediment barriers, construction of sumps, and riparian vegetation improvement projects.

Land Ownership Adjustments

Land acquisition would consolidate inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts and Ephemeral Wash Riparian Areas would not be included in land being considered for disposal, so no impacts would result.

OHV Use

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to maintained roads and designated

trails. OHV cross-country travel would be prohibited in intermittent washes unless an area is specifically designated for such use (Table 2-3). Therefore, the potential for negative impacts to riparian areas and washes from OHV use would be less than under the other alternatives, as long as the limitations are enforced.

Specially Designated Areas

The addition of the Ephemeral Wash Riparian Area would increase protection of riparian areas within the FFO. The increased acreage of CSU and NSO constraints in SDAs within the FFO would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The 58,553 acres with closed designations for OHV use are all in SDAs and would help to limit damage to riparian and wetland areas that may be within the boundaries.

Coal Leasing Suitability Assessment

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas, although fewer areas would be considered under Alternative C than under Alternative A. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately evaluated.

Special Status Species

Oil and Gas Leasing and Development

Alternative C would stress conservation of natural resources while allowing for increased

oil and gas development. It is estimated that there would be disturbance of over 31,000 acres of land with federal minerals. This would be an increase in disturbed land over Alternative A, and a decrease in disturbance from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Implementation of Alternative C would be expected to affect the same special status species as Alternative A. Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described in previous sections. The FFO would reinstate consultation as necessary to ensure compliance with ESA.

Land Ownership Adjustments

As under Alternatives A and B, habitat for federally listed and proposed species would be retained and protective measures for other sensitive species would be implemented as appropriate. Land acquisition would benefit special status species by consolidating public land where there is potential habitat. Land ownership adjustments would have no negative impact and possibly a positive impact on special status species.

OHV Use

Under this alternative, more land would be designated as closed or limited for OHV use than under Alternatives A and B. No additional land would be opened to OHV access. OHVs would be required to stay on graded, maintained roads outside designated areas. OHV use of 2-track roads and trails would only

be allowed in areas designated by FFO staff and no OHV travel in wash bottoms would be permitted. Therefore, the potential for OHV traffic to degrade special status species or their habitat would be low, less than under Alternatives A and B.

Specially Designated Areas

The modifications and additions of SDAs to protect special status species described under Alternative B would also be proposed under Alternative C. The Mexican Spotted Owl ACEC would replace the existing Laguna Seca SMA and management would implement the Recovery Plan to provide protection for this species. The Ephemeral Wash Riparian Area would provide protection to potential habitat for the southwestern willow flycatcher.

Coal Leasing Suitability Assessment

The development of land suitable for coal mining under Alternative C has little potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs and competitive lease tracts. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs and competitive lease tracts occur near or within the plover habitat. Coal mining in and near potential mountain plover habitat would require surveys to be completed and clearances issued before applications to mine would be approved. In addition, consultation with the

USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed commercial coal mining, and mines for home fuel use, would go through the NEPA process with documentation once exact locations are known, and an analysis of the proposed project impacts on special status species would be performed. Protective measures would be required once potential sites and impacts are known.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of Alternative C would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

The general impacts of oil and gas development and operations on wildlife would be greater than under Alternative A because more wells and roads are projected to be constructed, but less than under Alternative B. This alternative would include the establishment of 13 Wildlife Areas to manage big game and other wildlife, encompassing almost 397,000 acres of public land (Map 2-6).

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative C, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The total long-term loss of habitat from existing and projected development would be over 27,500 acres or 6.9 percent of the area (Table 4-6). An estimated 219 miles of new roads would be constructed in the Wildlife Areas, which would result in an increased road density from 2.6 to 3.0 mi/mi². Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional habitat loss within 660 feet and 75 to 88

percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap of those fragmented habitat areas.

This habitat loss would be likely to further reduce the carrying capacity of the wildlife habitat. The exact level of this reduction cannot be quantified for the same reasons given for Alternative A. The 397,000-acre area would be managed for big game and other wildlife mainly through prohibitions of some oil and gas operations in the winter and spring and vegetation management. Alternative C would be expected to result in a reduction of the mule deer and elk populations in the planning area due to habitat loss and fragmentation from oil and gas development. This reduction would be less than under Alternative B due to the implementation of wildlife management practices in the 13 Wildlife Areas and the construction of fewer new well pads and roads.

A total of 283 wells would be developed in the Ensenada Mesa Wildlife Area that is important to antelope under this alternative. The estimated amount of long-term disturbance including roads would be 900 acres or 2 percent of the total area. About 23 miles of roads would be constructed, resulting in an increase in road density from 3.8 mi/mi² to 4.1 mi/mi² for this alternative. The increase in habitat disturbance, roads, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A but less than under Alternative B.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. The loss of almost 8,600 acres of public land in the 397,000-acre area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the piñon-juniper woodlands and Great Desert Scrub habitats, which would not be replaced within the 20-year period of analysis by reclamation or revegetation.

Under Alternative C, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 27 acres in

the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance projected. No habitat loss would occur on USBR land because of NSO stipulations on oil and gas development.

Land Ownership Adjustments

The amount of land that would be available for disposal under this alternative would be about 338,000 acres of public land (Table 2-1), which is slightly more than under Alternative A, and less than under Alternative B. More land would be considered for acquisition under this alternative because there would be more land within SDAs for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

OHV Use

Most FFO land would be designated for limited OHV use under this alternative (Table 2-2) and OHVs would be required to stay on graded maintained roads. OHV use of 2-track roads or trails would be allowed only in designated areas and cross-country travel in washes would not be permitted in most cases (Table 2-3). Therefore, the potential for OHV traffic to degrade wildlife habitat would be lower than under the other alternatives.

Specially Designated Areas

Wildlife management, particularly for big game, would be expanded under this alternative to include Angel Peak, Cereza Canyon, Cox Canyon, Crow Mesa, Delgadito Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Manzanares Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as the Ephemeral Wash Riparian Area. Within the Laguna Seca Mesa Wildlife Area would be the Mexican

Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each wildlife area.

The Angel Peak Wildlife Area would become a designated wildlife area, which would lessen the impacts on pronghorn antelope through the implementation of timing limitations for oil and gas operations between May 1 and July 15. There would also be prescriptions in the Angel Peak Wildlife Area to manage vegetation for the needs of antelope, quail, and neo-tropical migratory songbirds that are dependent on sagebrush and grasses. Management prescriptions in the 13 Wildlife Areas would reduce the potential impacts of surface disturbance activities on wildlife.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining, resulting in fewer impacts on wildlife. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed and documented once locations of applications are known.

Wilderness

Oil and Gas Leasing and Development

Impacts from oil and gas development on the WA and WSAs would be the same as described for Alternatives A and B. Gradual increase in the new wells in surrounding areas could have some indirect impacts on wilderness qualities from changes in overall landscape quality and noise sources. Under this alternative, a Noise Policy would require that noise from any noise source (primarily compressors) be at levels of 48.6 dBA or lower in the WA and WSA. Some peripheral locations

may therefore experience noise levels that are higher than ambient levels that one would expect to experience in a wilderness setting.

Land Ownership Adjustments

A policy favoring acquisition over disposal, particularly on the edges of the WA and WSA would support wilderness values. Acquired lands inside the WA would be managed as wilderness, expanding protection of wilderness values. Acquiring lands in surrounding areas would minimize potential for indirect impacts of future development on adjacent wilderness qualities.

OHV Use

There would be no change in OHV designations that currently close the WA and WSA to OHV use.

Specially Designated Areas

Future designation and protection of the Ah-shi-sle-pah WSA would be the same as under Alternative B.

Coal Leasing Suitability Assessment

Impacts from coal mining would be the same as described for Alternative B.

Rangeland

Oil and Gas Leasing and Development

Impacts due to surface disturbance and fragmentation of grazing allotments under Alternative C would be greater than Alternative A and less than Alternative B. The same types of effects from the removal of forage in the high development area where oil and gas facilities should be constructed, the potential for poisoning if fences are not maintained around well pads, and the spread of noxious weeds, would exist.

Land Ownership Adjustments

The priority under this alternative would be land acquisition, rather than disposal. There would be few new impacts on permittees near the urban areas because it would be less likely that land in these areas would be transferred

out of federal control. The range allotments that would be affected are 5028, 5030, and 5032 on Crouch Mesa if land disposal were to be considered.

OHV Use

Impacts on rangeland would be less under this alternative than Alternatives A and B because OHV access would be limited to maintained and graded roads in most areas. This would result in fewer conflicts between OHV users and grazing permittees, and less potential for OHVs to spread noxious weeds.

Specially Designated Areas

Grazing limitations identified for some of the SDAs under Alternative C include approximately 52,000 acres closed to grazing, over 11,000 acres in which grazing permits would not be reissued if they expire, and over 600 acres that would be withdrawn from grazing. Grazing restrictions would be proposed in 67 SDAs. Because acquisition of inholdings would be a priority within these areas and the SDAs cover more acreage, grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B after acquisition is complete.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Oil and Gas Leasing and Development

Under this alternative, the level of oil and gas development would be less than under Alternative B, and is reflected in lower estimated surface disturbance and displacement of multiple use activities. Of the projected 18,238 acres disturbed, over half would be in existing ROWs and infrastructure corridors.

There would be 316 large new compressors, and about 4,920 small compressors at new well pads, in addition to

about 7,000 small compressors at existing wells gradually installed over the next 20-year period. Oil and gas facilities would need to meet a 48.6 dBA level at 100 feet of any dwelling or occupied structure. This standard would apply to new facilities in municipal areas if no appropriate standards exist. The standard meets compatibility guidelines established by the U.S. Department of Housing and Urban Development for all developed uses, including residential. Therefore, noise impacts on residential and commercial uses are expected to be minimal. The FFO would apply a maximum 48.6 dBA noise standard on 266,273 acres of public land in 88 designated NSAs, selected to protect recreational use, cultural sites, and wilderness values. These measures would reduce potential for incompatible noise levels with other uses on public and non-public land. Compared to Alternative B, with fewer small compressors and implementing the proposed Noise Policy, this alternative would have less potential for noise impacts, particularly at sensitive locations such as homes, occupied buildings, and specially designated NSAs.

Impacts to ongoing land uses from noise, dust, and emissions during development of new oil and gas facilities would be temporary and minor. They would occur less frequently than under Alternative B, but more than Alternative A.

Under Alternative C, an estimated 800 miles of new oil and gas roads could be constructed. Accounting for road reclamation, a net increase of 150 miles (or 1 percent) may result. Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels to as much as 18 percent higher than Alternative A. Therefore, no change to traffic flow would result from this alternative.

Land Ownership Adjustments

Under this alternative, BLM would tend to retain land in federal ownership and acquire inholdings. This would benefit continuity in access, assuming ROWs on private land are maintained in a timely manner. Up to 338,067 acres could be disposed of, particularly if

suitable acquisition areas were identified. The disposal area around the tri-cities area would be confined to the Crouch Mesa triangle. A smaller amount of BLM land (almost 14,000 acres) would become available for future urban growth and development, and nearly all would become split estate. Increase from split estate within the FFO administrative area would be similar but slightly less than Alternative B. Mineral development could be incompatible with high levels of residential development that is already occurring on Crouch Mesa. Impacts would be similar but less extensive than those described for Alternative B.

Designation of the WUG revised WRCS ROW corridors would provide for a managed approach to siting new infrastructure, potentially minimizing future disturbance and fragmentation from proliferating corridors. However, the specific alignment of new corridors would need to be environmentally cleared prior to designation.

Identification of valuable locations for salable minerals would allow for consideration of future access to these resources in any disposal actions that may involve these areas. This could limit future uses on some disposal areas in the tri-cities area.

OHV Use

Limited OHV access throughout the FFO should lessen conflicts between OHV users and adjacent private property owners. Disturbance of cattle and ranching operations should also decline with less pervasive access.

Specially Designated Areas

BLM could acquire 189,679 acres of non-federal inholdings within SDAs under this alternative, reflecting proposed new and adjustments within their boundaries. Accounting for proposed acquisitions, specially managed land could increase by 84 percent over current conditions. Over 64 percent of BLM land in the FFO would be in a SDA. Effects of acquisitions would benefit valuable natural, recreation, cultural, and wildlife resources. Application of management

prescriptions on these acquired lands could reduce the availability of lands for mineral entry, grazing, and other productive uses. Most of this land is in remote areas and would not affect the need to divest federal ownership near urban areas. Acquisition of inholdings in SDAs near the tri-cities area would benefit the recreational and open space needs of the urban area. Both community members and city planners have expressed this as a desired resource and for the expanding area and buffer against urban sprawl.

Coal Leasing Suitability Assessment

Under this alternative, expansion of existing coal mines in the FFO would not occur and only suitable portions of 14 PRLAs would be available for future production. Indirect impacts on the WSA could occur if a surface coal mining operation were developed adjacent to the WSA, indirect effects from noise, visual changes, and increased human activity could lessen the potential for a natural experience in the southern part of the WSA. There would also be potential to affect sensitive viewsheds of several cultural sites and the Chaco Culture National Historic Park, depending on location of any future mine. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

Under this alternative, about 9,800 new well locations are projected for areas overlying federal minerals and about 4,400 well sites reclaimed. A net increase of almost 900 well sites would increase the average well density on federal land from the current 2.6 to about 2.7 wells per square mile in the high development area. Impacts would be similar to those described for Alternative B, but would be less pervasive and contribute to potentially moderate changes in the overall landscape character.

The same degree of change would occur in areas with VRM Class I and II objectives.

Leasing stipulations would prevent some development of wells directly within these SDAs, but impacts could occur from directional drilling on adjacent areas with lower VRM objectives and indirectly affect visual values within the SDAs. Therefore, there is potential for degradation of visual conditions on the periphery of these areas. Closure of most VRM I areas to new oil and gas leasing would provide some additional protection. Enforcement of VRM standards would reduce effects of development on valued visual resources. This would continue to be managed primarily through selecting locations that are less visible but still operable in terms of extracting the resource.

Protection of visual values would be emphasized both on USBR and USFS lands under this alternative. Several measures, including NSO stipulations on USBR land around Navajo Lake, would lessen visible degradation, push new development back from the shoreline, and likely lessen the number of permitted new wells. Increasing the distance would reduce the visibility of new wells, but other mitigations may also be needed to meet VRM II objectives. USFS would require siting and physical mitigations to meet VRM objectives and minimize the visibility of new wells.

Land Ownership Adjustments

Under Alternative C, land adjustments would favor retention of federal land and allow for management of visual values. Acquisition of inholdings in SDAs would increase the acreage of public land in areas with high visual value and protection in the FFO.

OHV Use

A policy that limits vehicular use to roads and designated trails would prevent damage to soil and vegetation throughout the FFO area. To the degree that new restrictions can be enforced, this would prevent unsightly conditions caused by either repeated cross-country travel (that denudes vegetation, and causes visible scarring of the land and the spread of weeds) or heavy vehicles passing

over wet ground (that cause deep ruts). The policy on cross-country travel exceptions, and permittees and lessees, would be much more restrictive, allowing few cross-country exceptions.

Specially Designated Areas

With the expansion of SDAs, VRM Class I and II objectives would apply to more land within the FFO area (Table 4-9). The amount of land managed for VRM I and II objectives would increase to almost 18 percent of the FFO area. This would provide a strong basis for management decisions that conserve visual quality in the most values areas, providing a benefit for visual resources. New areas would be designated specifically for OHV use to concentrate motorized sports into specific locations. This would confine visual deterioration from OHV use to a much smaller area and benefit visual resources.

Overall, Alternative C would have the least impact on visual resources. Visual alterations from moderately aggressive levels of oil and gas development would be assuaged by emphasis on minimizing visibility of new development. Confining cross-county OHV use in the FFO area to a few areas would limit vegetative loss and soil damage that can alter the landscape.

Coal Leasing Suitability Assessment

Development of adjacent PRLAs could have indirect effects on viewsheds surrounding the WA and WSA if a new surface mine were developed. Visual resources would be protected in other parts of the FFO area through resolution of conflicts between new production and visual values.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

This alternative would potentially affect approximately 1,658 archaeological sites in the same four watersheds described in Alternative

A: Largo, Carrizo, La Plata, and Upper San Juan (Table 4-10). Cultural resource surveys and clearances would be required prior to issuance of APDs, and avoidance or mitigation of identified sites would be required.

The 796 miles of new roads (Table 4-3) constructed to serve oil and gas facilities would provide greater public access to cultural resources in the high development area, resulting in increased potential for vandalism.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternative A for archaeological sites to be damaged by vehicles driving across the landscape. No additional areas would be opened for OHV access, so there would be less potential for site damage than under Alternative B.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 SDAs that include approximately 89,000 acres in the FFO area. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree. Most of these areas would be designated as boundary-focused NSAs under Alternative C.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use.

Ground subsidence has already been documented in the vicinity of the Deep Lease coal mine in the northwestern part of the FFO area, identified as BHP Additional Coal Interest on Map 2-8. Impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation and monitoring before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative C would involve less acreage of surface disturbance and have fewer potential impacts to paleontological resources than under Alternative B, but more than under Alternative A. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

Impacts on paleontology would be the same as Alternative B.

OHV Use

Impacts on paleontological resources would be similar to Alternative B. However, no additional areas would be designated open to OHV access, so there would be less potential for impacts to paleontological formations from OHV use than under any other alternative.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under

Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. With only 9 PRLAs (14 minus 5 within Ah-shi-sle-pah WSA) available for coal mining under this alternative, there would be the least potential for impacts to paleontological resources if additional coal mining were to be approved.

Recreation

Oil and Gas Leasing and Development

Existing well density in the recreation areas would increase, having similar relative impacts as described for Alternative A from changes in visual surroundings, isolated noise sources, traffic, and other oil and gas activity. The total portion of the FFO that may be displaced in recreation areas is somewhat less than under Alternative B (1.4 percent compared to 2.4 percent), and dispersed over a larger area (75,174 acres). The resulting average well density in recreation areas would increase by about 63 percent over existing conditions in recreation areas (Table 4-11).

Under this alternative, the 48.6 dBA or lower noise standard would apply to over 206,000 acres with federal minerals in the FFO.

With the exception of the areas developed for motorized vehicle recreation, recreation areas are designated as noise sensitive and would be protected under the Noise Policy. This policy would apply to oil and gas development adjacent to the WA and WSA. While this provides benefits over current conditions, noise levels of 48.6 dBA would not be desirable for many outdoor dispersed recreational activities.

Impacts on dispersed recreation and campgrounds on USFS land would be less than under Alternative B due to fewer new wells (about 510) and application of the proposed Noise Policy. Also, USFS would implement several constraints and practices that would conserve the natural environment and landscape, providing indirect benefits to recreation. Impacts on USBR lands from oil and gas development would be less than those described in Alternative B due to the NSO constraints. Most new well sites would tend to be located further from recreation sites, minimizing direct visual and acoustic impacts on visitors.

Land Ownership Adjustments

In general, retaining land in federal ownership would tend to preserve land for public access and multiple use, including recreation. Only land on Crouch Mesa would be disposed of in the tri-cities area, reducing the potential for conversion of open space to urban use. This is a desirable conversion since it is difficult for BLM to monitor recreational activity on areas that are highly accessible to a large number of persons. Similar to Alternatives A and B, the BLM would review applications for exchange or lease and patenting under R&PP Act for consistency with recreational objectives. Open space for recreation would be preserved around the tri-cities area under this alternative.

OHV Use

Under this alternative, a limited OHV designation would be applied throughout the FFO area unless otherwise designated. Vehicles would need to stay on maintained roads, such as oil field service roads, and designated trails. This policy is intended to simplify current policies and correct ambiguities that make

enforcement by BLM and compliance by the public problematic. Cross-country travel would no longer be allowed in the FFO area, except in small designated areas.

Table 2-2 shows that less than 1 percent of federal land in the FFO would have an open designation under Alternative C. This would occur only on 4,616 acres within areas specially managed for cross-country OHV uses (the Dunes and portions of GRTS). No additional land would be considered for possible open designation. These restrictions are expected to reduce impacts on soil and limit loss and deterioration of vegetative cover. Also, noise from OHV use would be more controllable and predictable. Areas adjacent to the Dunes and Head Canyon may still experience incompatible noise. New Recreation Areas, particularly Rock Garden and Piñon Mesa, would have developed trails for OHV use. People who prefer unconstrained access to public lands would not favor these restrictions. Other recreationists would benefit from the lack of disruption caused by cross-country motorized vehicle use. The trend to provide separate trails and areas for different classes of conveyance would lessen some of the conflicts currently reported by recreationists. Designation of 94 miles of new trails would benefit a variety of motorized and non-motorized vehicles.

Specially Designated Areas

Similar to Alternative B, Alternative C would respond to some specific recreational needs in the FFO area. These have mostly been identified through meetings with local user groups and observations of BLM specialists.

Specially managed recreation areas would increase in extent by almost 60 percent (to 83,293 acres) over current conditions, and represent 6 percent of the FFO area. This would benefit recreational opportunities by providing protection of these values on more land. Four new Recreation Areas are close to the tri-cities area and would therefore directly benefit local users. The areas identified would generally be larger than under Alternative B with more extensive NSO stipulations on oil

and gas development. ROS classifications would also be allocated to additional land. As shown in Table 4-12, the amount of land under ROS management would double over current conditions. However, due to current road density and intended motorized use of some of the new areas, they would mostly be managed for the least stringent classifications (Rural and Roaded Natural). More emphasis would be placed on preserving visual qualities (see Visual Resources). This would benefit a large range of outdoor recreational pursuits.

Changes in management prescriptions for recreational areas and other resource areas would generally benefit the quality of recreational opportunities to a greater degree than under Alternative B. Prescriptions would be more conserving of natural and real estate resources that benefit recreation than under Alternative B. For example, some sensitive areas would be closed to new ROWs, developed sites may be closed to shooting (for safety reasons), and additional areas may be closed or withdrawn from grazing or mineral entry and leasing. Also, VRM Class I would be maintained wherever it currently applies. As under Alternative B, appropriate and manageable portions of recreation areas near the urban centers would be available for hunting.

Coal Leasing Suitability Assessment

Limited development may occur in portions of 14 PRLAs, but these do not overlap with any specially designated Recreation Areas. Expansion of the San Juan mine would not be pursued, lessening potential impacts of highly visible mining operations near the urban edges, where recreational use is increasing noticeably.

Noise

Oil and Gas Leasing and Development

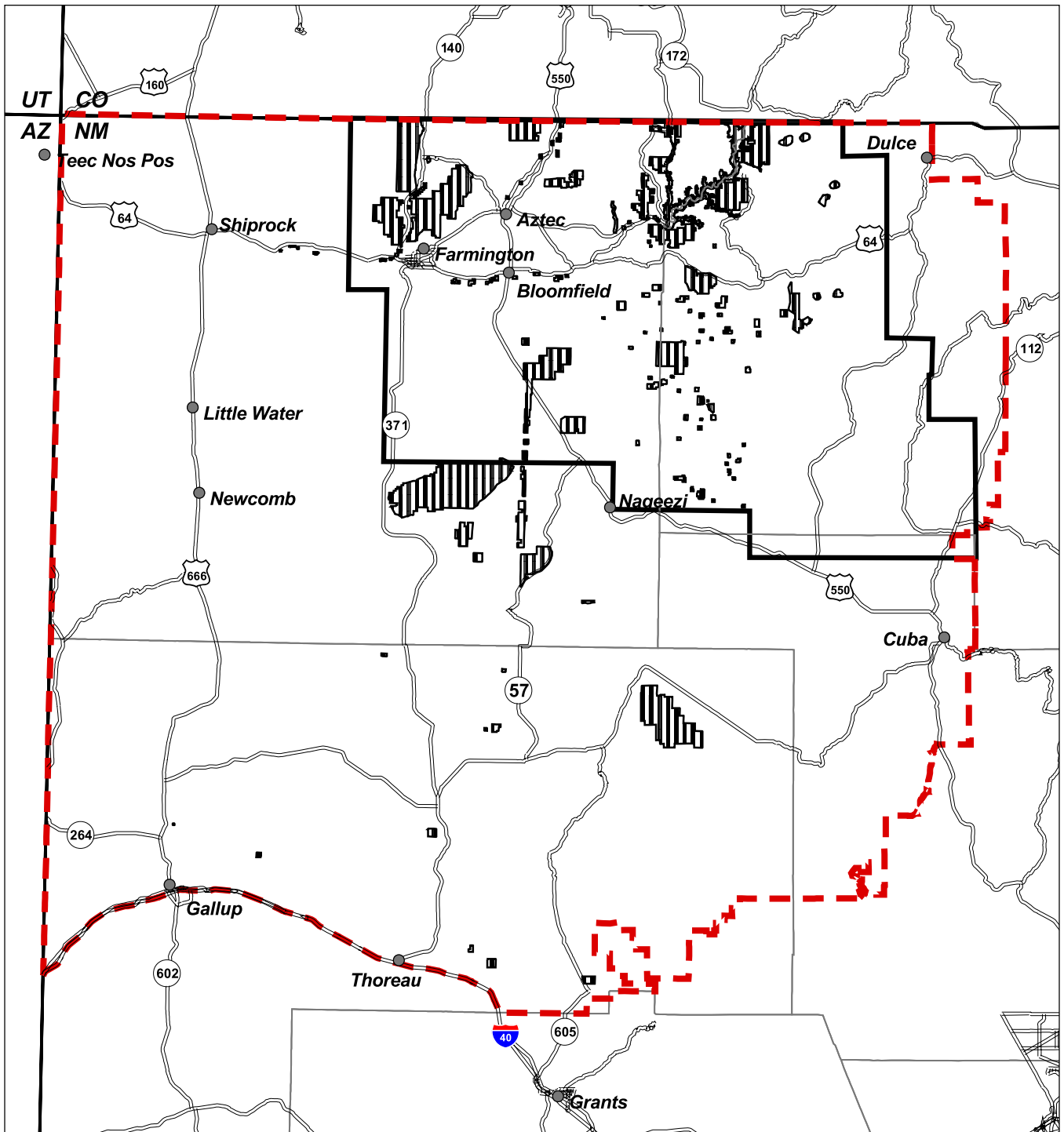
The major cause of noise impacts would be the increased number of wellhead compressors

associated primarily with gas operations. With 9,836 new wells projected under Alternative C, and approximately 14,400 existing wells on public land, this could result in 12,100 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 296 mid-size compressors (500 to 2,000 HP) would be installed under Alternative C. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.









A Noise Policy (Appendix E) would require noise mitigation to be implemented inside the boundaries of 97 designated NSAs in the planning area, and within 300 feet from the noise source near these NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This standard must also be met within 100 feet of dwellings and municipal areas. The mitigation requirements would apply to over 206,000 acres with federal minerals, 135,000 acres of which would be in the high development area. **Map 4-2** shows the areas subject to the Noise Policy under Alternative C.

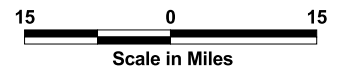
This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as described under Alternatives A and B.



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LEGEND

-  RMP/EIS Boundary
-  Oil and Gas High Development Boundary
-  NSA Area
-  Town
-  Major Road
-  Interstate Highway
-  U.S. Route
-  State Highway



Source: BLM 2001

Map 4-2: Noise Sensitive Areas in the FFO under Alternative C

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. The impacts would be much greater than under Alternative A because there would be 2,700 more small compressors and 174 more large compressors in use over the 20-year period. Implementation of the Noise Policy established in an NTL to oil and gas operators would provide localized noise mitigation within and near the designated areas.

The Draft NTL presented in Appendix E would be considered final upon approval of the RMP.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

OHV Use

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts. Development of OHV management plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Specially Designated Areas

Under the proposed Noise Policy, there would be 88 SDAs that are identified as NSAs.

These areas are shown on Map 4-2 with the other NSAs in the planning area.

Social and Economic Conditions

Employment

Under Alternative C, based on a total of 9,836 new wells (and about 5,300 at new sites) and reclamation of 4,398 wells per year over the next 20 years. There would be a gain of about 500 jobs per year over current levels at the end of 20 years, resulting in a minor increase of about 6 percent in oil and gas industry job levels.

As recoverable coal is depleted, production at La Plata and San Juan (surface) mine would cease, with a possible loss of about 400 to 450 jobs. Because production from the San Juan Underground mine would replace supply from San Juan surface and La Plata, it is expected that the San Juan power plant would continue to operate. The loss of 450 direct jobs in the coal industry is regionally insignificant (less than 1 percent of the four-county civilian labor force), but would have local impacts on the tri-cities area and Crownpoint areas, where most of the workers reside. Some of these jobs may be offset by expansion and hiring at the San Juan Underground mine. Later in the planning period, jobs may decline at McKinley mine as well. Under this alternative, because no coal production on FFO land would occur, and there would be no increase from other actions on FFO land, there may be no offset of these job losses. However, other mines may expand, such as the Navajo mine and non-federal interests, providing jobs within the region. Overall, slight gains in fluid mineral jobs would be offset by possible layoffs of coal jobs, for no net benefit to employment and earnings.

Expenditures

Under Alternative C, the estimated cost for drilling 9,836 wells is about \$5.3 billion, at an average cost of \$535,000 per well. Additional direct costs would increase the total investment to about \$6.2 billion. Additional indirect expenditures could result in a total of about \$7.9 billion spent over 20 years, or an average

of \$394 million per year (non-escalated). This represents a 230 percent increase in expenditures for oil and gas development on federal land compared to Alternative A. Current expenditures are estimated to be about 11 percent higher than those estimated for this alternative, but these have fluctuated over the last decade in response to market-driven forces.

Revenues

Under Alternative C, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,125 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of \$3.00 per Mcf, the total value of this product could be about \$33.4 billion (in 2001 dollars). Production of federal oil and gas resources would more than double over current levels over the 20-year planning period, providing for a much higher tax and royalties revenue base for the State of New Mexico. However, any revenues would be dependent on the value of the product.

Under this alternative, changes in coal production on federal land would be minimal in the next 5 years. As the McKinley mine loses production, there could be a decline in coal royalties paid to the state; however, new production is expected to occur within the Four Corners area. Because coal royalties are a relatively small portion of the New Mexico General Fund, compared to oil and gas, these losses would have a minor impact on state revenues.

Grazing could be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw grazing. Under this alternative, the change to the land available for grazing would be modest (about 6 percent of the FFO land), but greater than under Alternative B. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. A reduction in permitted AUMs would decrease

fees paid to the FFO. Changed management prescriptions for several SDAs could affect larger areas of contiguous land, potentially affecting some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. Slightly reduced cattle numbers would lower the total productive grazing value in the FFO area by about 6 percent. Although the value is small in relative terms, this loss could affect some smaller operators and have a minor negative impact on local cattle ranching.

Environmental Justice

Potential impacts to persons of minority or low-income status would be similar to those described for Alternative A. The oil and gas industry would continue to provide job opportunities, but would still be subject to market fluctuations. The new Noise Policy would lessen the potential for impacts on land uses and communities throughout the planning area, particularly from development of federal minerals on split estate (including tribal lands). It is likely that a high proportion of workers at San Juan and La Plata mine are Native American or Hispanic. Loss of mining jobs could therefore have a moderate impact on minorities in the local area.

Change in OHV use on federal land under Alternative C may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

ALTERNATIVE D—BALANCED APPROACH

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of surface disturbance associated with well construction would be 18,393 acres for Alternative D. Surface disturbance associated with large pipelines is assumed to be 11,683 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,695 acres for Alternative D (Table 4-1).

Subtracting reclaimed acreage of 13,194, the net amount of surface disturbance under this alternative would be 18,577 acres. This does not include plugged and abandoned wells already awaiting approval for reclamation.

Watersheds

Under Alternative D, initial short-term surface disturbance is estimated to total approximately 36,500 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 174 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 1 and 13 percent in those watersheds. The total increase in new roads would be approximately 805 miles in the planning area (Table 4-3), without taking into account road closures due

to P&A wells. This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines in the center of the high development area.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative D assumes that commingling and dual completions would be common. The number of completions allowed on federal land under this alternative would be 9,942 after consideration of stipulations that would limit access to 28 wells. NSO constraints would require 145 directional wells (1.5 percent of all wells on federal minerals) to be drilled to access formations under SDAs and Navajo Reservoir. There would be 81,000 acres closed to new leasing. Because 99 percent of the high development area is currently leased, there would be little impact on mineral extraction from lease closure designations.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative D than Alternatives A and C, but fewer than under Alternative B. These quarries would be

approved with the APDs, or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under current management over 340,000 acres of public land would be available for disposal, of which approximately 304,500 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be the potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be similar to that described under Alternative B because the size and location of the disposal areas would be the similar. FFO staff would coordinate land use decisions to avoid limiting access to the 6 salable mineral areas.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitations on the use of surface resources within their boundaries. Due to NSO constraints within SDAs in the FFO, there would be 12 wells that would not be developed and approximately 87 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

The number of potential conflicts for mineral extraction under this alternative would be similar to that described under Alternative B because the same PRLAs, competitive lease tracts, and Additional Coal Interest areas would be available for new mining.

There are approximately 168,900 acres within the FFO area that have already been fully screened through application of the unsuitability criteria. The remaining acreage outside the high oil and gas development area under FFO jurisdiction have been partially screened by applying the unsuitability criteria at a coarse resolution with currently available GIS data, resulting in the identification of an additional 209,400 acres that have the potential to be mined for coal. All acreage would be open to leasing-by-application (43 CFR 3420) but would require the application of the unsuitability criteria prior to leasing action.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternatives A and C, but less than under Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 36,500 acres. When accounting for the reclamation of P&A well locations and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be approximately 18,600 acres. The resulting impacts to soils would be an increase in soil erosion, but the amount of increase would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under

Alternative A because the watersheds with the most prime farmland soils are within the high development area for oil and gas. Mitigation measures described under Alternative A could be employed to minimize impacts during site reclamation.

OHV Use

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce any existing vegetative cover, while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts were eliminated from consideration. Site-specific evaluations would be conducted before final open designations are made.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, which would all be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation and a weed management plan would be required after mine reclamation to stabilize the slopes and soils,

minimize erosion, and reduce the spread of weeds. Native plant species would be required in seed mixtures under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative D, new oil and gas development would result in an increase in net surface disturbance of almost 18,600 acres. Water required for the drilling operations would amount to approximately 7,000 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternatives A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the impacts of this would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the initial increased acreage of surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tri-cities area that would be considered for development could result in an increase in

water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative D are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative D, potential impacts to water resources would be less than under Alternative A. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

Alternative D contains more acreage of SDAs (649,470) and more restrictive management prescriptions for surface disturbing activities than Alternatives A and B. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. This protection would be provided in 43 percent of the public land in the FFO area. In situations where OHV cross-country travel would be permitted within a SDA, a localized negative impact to water resources could result.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Clearances for all resources, and installation and maintenance of BMPs to reduce surface

water runoff and erosion, would be required for both commercial mines and those for home fuel use, according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative D proposes to develop 9,942 new gas wells on federal lands, which would produce approximately 11,002 Bscf of gas over the 20-year period of analysis. This production rate is slightly less than production estimated for Alternative B. Emissions from gas production for Alternative D were estimated by the same methods used to estimate emissions for Alternative B, which focused on the number of proposed wells. This approach was taken, as it is believed that the number of wells and their associated compression demands influence emissions from this activity more than production amounts. Annual emissions and resulting ambient air quality impacts from gas production under Alternative D therefore would be about 70 percent of those estimated for Alternative B. However, it is possible that isolated cases of near-field ambient impacts could approximate those estimated for Alternative B in areas of high-density well development. Appendix J includes the emissions estimates for Alternative D.

OHV Use

Proposed OHV usage under Alternative D and its resulting air quality impacts would be somewhat less than for Alternative A, due to limitations on cross-country travel.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that

have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land could be almost 32,000 acres. Initial short-term surface and vegetation disturbance during construction would affect 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period considered. Developers would be encouraged to use existing road and pipeline ROWs to minimize additional disturbance.

The increased surface disturbance and vehicle traffic would increase the spread of noxious weeds. Weed management plans would need to be developed and implemented to minimize this problem and protect native vegetation.

Land Ownership Adjustments

Over 340,000 acres of public land would be available for possible disposal under Alternative D (Table 2-1) in most of the same areas as those described for Alternative B. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative B. An estimated 178,000 acres

would be available for acquisition (Table 2-1), more than would be available for Alternatives A and B, and less than under Alternative C. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B. This has the potential to result in a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized on the acquired acreage. Weed management plans would be developed and implemented on the acquired acreage.

OHV Use

Most FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B and less than under Alternative C (Table 2-2), OHV use of 2-track roads or trails would be allowed in designated areas, and additional areas would be considered for open designations in several OHV management units in the future through the appropriate land use planning process. The potential for OHV traffic to degrade upland plant community types would be less than under all but Alternative C.

Specially Designated Areas

There would be limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within SDAs under Alternative D than under the current management. There would be more acreage within these areas than under Alternatives A and B, so the limitations on land use, such as vegetation-disturbing activities, OHV access, and grazing would be applied to more public land within the FFO area than under current conditions, resulting in the potential for improved vegetative cover in approximately 45 percent of the public land in the FFO. If inholdings are acquired within SDAs, weed management would be more

successful on consolidated blocks of public land.

Coal Leasing Suitability Assessment

Two new coal mine areas have been identified. Peabody Coal Company identified the Lee Ranch Area and BHP identified the Twin Peak/East Piñon area. Coal leases would be considered on 378,000 acres that remain after preliminary application of the unsuitability criteria was completed for the FFO area at a coarse resolution. Before approval of mining would be granted, proposed coal mining locations would be evaluated through reapplication of the unsuitability criteria and analysis of project impacts through the NEPA process, once site-specific locations are known. All coal mines, commercial and home fuel, would be reclaimed and revegetated. Weed management plans would be required to minimize the spread of noxious weeds.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

Approximately 2,500 acres of public lands along the San Juan, Animas, and La Plata Rivers would be protected by CSU constraints outlined in the River Tracts Riparian Area. In addition, the FFO proposes to establish the Ephemeral Wash Riparian Plan to ensure that development does not occur in active flood plains, and develop mitigation measures for all new disturbance within 100-year floodplains of designated riparian areas. Mitigation would focus on, but is not limited to, restoration of wash channels by construction of sediment barriers, construction of sumps, and riparian vegetation improvement projects.

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes. Designated FFO riparian areas such as the River Tracts and Ephemeral

Wash Riparian Areas would not be included in land being considered for disposal, so no impact to these areas would result.

OHV Use

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to designated roads and trails, and intermittent washes (Table 2-3), so the potential for negative impacts to riparian areas and washes from OHV use would be greater than under Alternative C and less than under Alternative A, as long as the limitations are enforced.

Specially Designated Areas

The addition of the Ephemeral Wash Riparian Area and maintenance of the River Tracts Riparian Area would increase protection of riparian areas within the FFO. CSU constraints in other SDAs within the FFO would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The areas with closed designations for OHV use would also help to limit damage to riparian and wetland areas that may be within their boundaries.

Coal Leasing Suitability Assessment

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas. Coal mining has the potential to directly affect arroyos, and permits and associated BMPs for activities that could affect waterways and wetlands may be required. The potential for this impact would be assessed in a project-specific NEPA document once the exact location of the mining application is known. It is not anticipated that coal mining would significantly affect riparian areas due to requirements for mitigation and pollution prevention, but site-specific analysis would be required once a

location has been requested for consideration before this could be accurately addressed.

Special Status Species

Oil and Gas Leasing and Development

It is estimated that 9,942 new wells would be developed under this alternative over the next 20 years, resulting in the disturbance of almost 36,500 acres of land with federal minerals (Table 4-2). This would be an increase in disturbed land over Alternative A, and a decrease from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Consultation has been completed with the USFWS for this alternative and a biological assessment was prepared (BLM 2002c). BLM's findings are that oil and gas development under Alternative D may affect but would not adversely affect listed and proposed species or designated critical habitat. The USFWS concurred with BLM's findings in a letter dated October 2002.

Not all rare species receive the legal protection of the ESA of 1973 as amended. These species may not be rare enough to warrant protection under ESA, or there may not be sufficient data collected about the species for the USFWS to make a determination to list under ESA. Rare species or species with insufficient data are referred to as sensitive species. BLM policy, as outlined in the Guidance on Special Status Species Management (6840 Manual), is to manage sensitive species so that actions the BLM funds, authorizes, or carries out should not contribute to species becoming listed under ESA. Lists of special status species are maintained by several agencies, including the USFWS, BLM, USFS, and the State of New Mexico. There are 34 special status species that may have the potential to occur in the planning area. (Table 3-12). FFO has coordinated with other agencies to determine which of these 34 species warrant

special management, or field studies to collect data.

Currently, the following species receive special management: beautiful gilia, also known as Aztec gilia (*Aliciella formosa*), Brack's fishhook cactus (*Sclerocactus cloveriae* var. *brackii*), American peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), ferruginous hawk (*Buteo regalis*), yellow-billed cuckoo (*Coccygus americanus*), and western burrowing owl (*Athene cunicularia*). Potential bat habitat is surveyed before construction projects that would impact sandstone cliff faces are authorized. FFO conducted 3 years of surveys to determine the potential abundance and management needs of the gray vireo. In the future, FFO will cooperate with other agencies to gather data and develop special management for special status species when the situation warrants.

The BLM would continue to manage non-federally listed species, according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

Land Ownership Adjustments

The amount of land that would be made available for disposal in the tri-cities area is similar to that under Alternative B, although the total acreage listed for disposal would be less. The land in the tri-cities area typically consists of degraded habitat in close proximity to human activity, and is therefore considered marginal habitat. The FFO would retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and that is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

The amount of land open to OHV use under Alternative D would be 4,616 acres. The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-4). It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys and placed on the conflict map maintained at the FFO.

Specially Designated Areas

The modifications and additions of SDAs to protect special status species described under Alternative B would also be proposed under Alternative D. The Ephemeral Wash Riparian Areas would provide protection to potential habitat for the southwestern willow flycatcher. Similarly, habitat management practices for the proposed Mexican Spotted Owl ACEC would provide protection for this species.

Coal Leasing Suitability Assessment

The development of land suitable for coal mining under Alternative D has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Additional Coal Interests. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because these areas would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on

FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs, competitive lease tracts, and Additional Coal Interests occur near or within plover potential habitat. Applications to mine coal (commercial and for home fuel use) in and near potential mountain plover habitat would require plover surveys to be completed before they would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed coal mining would go through the NEPA process and an analysis of the proposed project impacts on special status species would be performed when site-specific locations are considered. Clearances would be required and site reclamation would be conducted once mining is completed.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of the preferred alternative would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative D, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The long-term loss of habitat from existing and projected development would be over 27,000 acres or 6.9 percent of the area. An estimated 220 miles of new roads would be constructed, which would result in an increased road density from 2.6 to 3.0 mi/mi². Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional

habitat loss within 660 feet and 75 to 88 percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap in those fragmented habitat areas.

The estimated number of new wells and roads and associated functional habitat loss under Alternative D would be slightly greater than under Alternative C in the entire planning area, but the same within the 397,000 acres of wildlife habitat. Of the 397,000 acres used to assess the impacts of oil and gas development on wildlife, 297,000 acres of public land would be included in 9 Wildlife Areas (Map 2-6) to be managed for big game and other wildlife through timing limitations on oil and gas development activities in the winter and spring, vegetation management, and other measures. Potential habitat loss and fragmentation in the pronghorn antelope habitat in the Ensenada Mesa Wildlife Area would be similar to that described under Alternative C.

Habitat loss and fragmentation would be likely to further reduce the carrying capacity for wildlife although the exact level of this reduction cannot be quantified for the same reasons given under Alternative A. The impacts on mule deer, elk, pronghorn antelope, and other wildlife would be slightly more than those described under Alternative C, and could result in a reduction of the wildlife populations in the planning area as compared to Alternative A.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. The loss of almost 8,600 acres of public land in the 397,000-acre area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the piñon-juniper woodlands and Great Basin Desert Scrub habitats, and most of this habitat would not be replaced for a long time after well pad reclamation.

The number of new wells and roads on USFS and AFO lands would be the same as under Alternative C. More wells (approximately 140) would be developed on USBR land than under Alternatives A and C, but less than under

Alternative B. New wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 200 acres on USBR land, 30 acres on the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for the FFO area also occur on other federal lands. It is believed that the impacts of Alternative D on wildlife in these areas would be less than on FFO land due to the lower levels of oil and gas development and associated habitat disturbance.

Land Ownership Adjustments

The amount of public land that would be available for disposal under this alternative would be over 340,000 acres (Table 2-1), more than under Alternatives A and C and less than under Alternative B. More land would be considered for acquisition than under Alternative A because there would be more land within SDAs for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

OHV Use

The amount of land open to OHV use under Alternative D would be 4,616 acres, with the possibility that more could be designated as open in the future (Table 2-4). The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to wildlife from cross-country travel would be much less.

Specially Designated Areas

Wildlife management, particularly for big game, would be expanded under this alternative (as compared to current management) to include 297,000 acres of public land in Cereza Canyon, Crow Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as Ephemeral Wash Riparian Area. Within the

Laguna Seca Mesa Wildlife Area would be the Mexican Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each Wildlife Area. Constraints such as TLs in the 9 Wildlife Areas would reduce the potential impacts of oil and gas operations and other human activities on wildlife.

Coal Leasing Suitability Assessment

Specific locations of new coal mining areas on FFO land have not been identified. Coal mines would not be located within the best wildlife areas. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland wildlife habitat would be performed at that time.

Wilderness

In general, impacts on the WA and WSAs would be generally similar as those describe for Alternative C.

Potential development of coal leases and interests and PRLAs (depending on adjudication) on land surrounding the WA and Ah-shi-sle-pah WSA could have similar indirect impacts as described for Alternative B. Unsuitability criteria screening would reduce potential for direct impacts of mining within these areas.

Rangeland

Oil and Gas Leasing and Development

The impacts under this alternative would be similar to those under Alternative C, with slightly greater acreage of forage removed by oil and gas development in the high development area.

Land Ownership Adjustments

The impacts of land disposal under Alternative D would be similar to those but slightly less than under Alternative B because

the 3-mile area near the tri-cities area would be a priority for land transfer.

OHV Use

Impacts on rangeland under this alternative would be similar to Alternative C.

Specially Designated Areas

Grazing limitations in SDAs would affect over 25,000 acres in 31 areas. Most grazing permits in 4 areas would not be reissued if they expire. Acquisition of inholdings in these areas would be a priority, so grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Impacts on lands and land use from this alternative would generally be similar to Alternative C.

Oil and Gas Leasing and Development

Oil and gas development would generally be similar to Alternative C. Disturbance, displacement and new road construction from 9,942 new wells (involving about 5,370 new locations) would be similar in extent to Alternative C. The Noise Policy under this alternative would provide similar standards to adjacent uses on non-public land for residential, community uses, cemeteries, parks, and other noise sensitive uses. The Noise Policy would apply for a combination of 13 defined areas and 42 point locations. This would provide standards for somewhat less acreage than the FFO but would apply to most sensitive locations.

Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels (with a possible slight reduction based on new well development), but about 20 percent higher than projections for Alternative

A. However, industry traffic has fluctuated in response to production demands. Over the long-term, industry-related traffic would be similar to Alternative C, and could contribute to higher traffic and changes in traffic flow on some roads. Temporary impacts during construction to ongoing land uses would be similar to Alternative C.

Impacts from oil and gas development on access within the planning area would be similar to Alternative C. A net increase in roads of 1 percent would have minimal effect on access.

Land Ownership Adjustments

The land disposal area would be similar to Alternative C, with the addition of land between Aztec and Bloomfield. This would provide a mixture of benefits by augmenting urban land supplies, and keeping valuable open space for recreation. Retention of federal mineral ownership would cause additional split estate, having the same effect as described for Alternative C.

OHV Use

OHV access would be similar to Alternative C, with slightly more access allowed off roads for special or exceptional uses. Also, consideration of some suitable areas for cross-country travel during development of OHV management unit plans could benefit access in some areas.

Specially Designated Areas

Provisions for and changes in SDAs would be similar to Alternative C, with somewhat less land designated for wildlife values. BLM would acquire a slightly larger area (178,237 acres) of inholdings within SDAs than under Alternatives A and B, potentially increasing the total managed areas by 50 percent. Accounting for proposed acquisitions, expansion of some areas, and new designations, specially managed land could increase by 75 percent over current conditions. Effects of acquisitions on public land management would be the same as described for Alternative A.

Coal Leasing Suitability Assessment

Future development of competitive lease tracts, and other coal interests, particularly in the Lee Ranch/Hospah area and the BHP interests near La Plata and San Juan mines would be likely. Impacts on lands and land uses would be similar to those described under Alternatives A and B. All coal mines, commercial and home fuel, would be required to be reclaimed when completed. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

The level of oil and gas development projected for this alternative is similar to Alternative C. The potential impact to characteristic landscapes would be the same as described for Alternative C.

Impacts from oil and gas wells on USBR land would be greater than Alternative C and less than under Alternative A. On USFS land, proposed practices would tend to be protect visual conditions and impacts would be similar to Alternative C.

Land Ownership Adjustments

Land adjustment policies under this alternative would favor acquisition of inholdings in SDAs and potentially would increase management of visual resource values in areas with potential value. This would benefit visual resources. Disposals in the tri-cities area would not be expected to affect prime visual resources in the FFO area, so little impact to visual resources would result.

OHV Use

Impacts on visual resources would be similar to those described under Alternative B.

Specially Designated Areas

Under Alternative D, management of FFO lands for VRM objectives would be similar to Alternative A. The amount of land managed for VRM I and II objectives would increase to

almost 16 percent. This is slightly higher than for Alternative B, and slightly less than for Alternative C. This moderate increase would benefit conservation of visual qualities in the areas with highest value.

Coal Leasing Suitability Assessment

This alternative would protect Ah-shi-sle-pah WSA from future coal development and preserve the outstanding visual quality of the area. Expansion of San Juan mine and development of a new mine on any of the competitive lease tracts or coal interests could cause highly visible surface disturbance. Mines for home fuel use would cause minimal visual impact. According to an industry study, development of coal interests around Lee Ranch and Hospah are most likely. Most of these areas have VRM Class III or IV ratings and would allow moderate or fairly extensive modification. However, specific locations may be in the viewshed of many sensitive cultural sites and areas with high visual value. Impacts from new mine development would be similar to those described for Alternative A.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

This alternative would affect approximately 1,895 archaeological sites in the same watersheds as the other alternatives (Table 4-10). The 805 miles of new roads in the high development area would provide new public access to archaeological sites and TCPs, potentially increasing vandalism.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites

would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternatives A and B for archaeological sites to be damaged by vehicles driving across the landscape. If additional areas were to be designated as open for cross-country travel, cultural resources surveys would be required and clearances would be issued before the areas would be approved.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 SDAs within approximately 78,700 acres in the FFO area. The Noise Policy would require mitigation of noise either within the boundary or from important cultural sites within 34 cultural ACECs.

This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use. Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative D would involve less acreage of surface disturbance and therefore result in fewer impacts to paleontological resources than under Alternative B, but more than under Alternatives A and C. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

Impacts to paleontological resources would be the same as under Alternative B.

OHV Use

Impacts to paleontological resources would be the same as under Alternative B.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs. This includes approximately 135,000 acres of public land within Betonnie Tsosie, Bohanon Canyon Complex, Carson Fossil, Fossil Forest, Gobernador and Cereza, Kutz Canyon, Lybrook Fossil, Piñon Mesa Fossil, and Torreon Fossil Fauna Paleontology Areas.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal

mining. Consequently, there could be the potential for additional impacts if additional coal mining were to be approved in areas where unidentified paleontological resources occur.

Recreation

Oil and Gas Leasing and Development

Impacts from development of 360 new wells under Alternative D in expanded recreation areas would be similar to those described for Alternative C. With up to 12,500 new small compressors and 320 large compressors located throughout the FFO, there may be several locations affected by noise. The Noise Policy under this alternative would designate some recreational sites by point locations rather than an inclusive area. Less land would be protected from potentially undesirable noise levels from well site compressors. However, the policy provides for the 48.6 dBA level or lower at key locations, trails, campgrounds and recreational sites with specified buffer areas. Specific recreational resources would benefit from the Noise Policy proposed under this alternative, but most of the FFO could be affected by widespread noise sources. This could degrade the quality of the area for dispersed recreation.

Land Ownership Adjustments

Impacts of land adjustments under Alternative D would be similar to Alternative C. The BLM would be more open to land disposal in the tri-cities area, but would continue to review R&PP Act applications for consistency with BLM objectives and identified community interests, particularly for outdoor recreational facilities for motorized and un-motorized vehicles.

OHV Use

OHV classifications and impacts on recreational use of OHVs would be similar to those described for Alternative B, with somewhat less land (about 66,000 acres) being potentially suitable for open OHV designation

after further planning is pursued. Other discrete areas would be available for specific recreationist activities such as controlled OHV use in Angel Peak Recreation Area, as well as wash bottoms and more trails designated for specific one- or two-track uses.

Specially Designated Areas

Recreation management areas would increase by 42.4 percent over current (the same as Alternative C), benefiting recreational resources in the FFO. ROS classifications would be essentially the same as Alternative C. More areas would be available for hunting and shooting access than under Alternative C.

Coal Leasing Suitability Assessment

Expanded coal development in the vicinity of San Juan mines would generally limit the desirability of the immediate area for recreation. Potential impacts to the proposed Piñon Mesa Trail Recreation Area could be the same as under Alternative B. Potential development in the south part of the FFO would have less potential to affect recreation. However, several cultural sites also provide for public visitation and may be affected by altering the context of cultural resources (from oil and gas and coal development). Overall impacts on dispersed recreational opportunity would be minimal. Coal development would not occur in the WA or WSA, benefiting opportunities for the most primitive and remote recreational experiences.

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 9,942 new wells projected under Alternative D, and 14,400 existing wells on public land, this could result in almost 12,200 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the

source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 299 mid-size compressors (500 to 2,000 HP) would be installed under Alternative D. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

A Noise Policy (Appendix E) would require noise mitigation within 400 feet of the noise source to be implemented inside the boundaries of 16 designated NSAs, and within a specified distance from receptor points in 45 additional NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This noise standard would also be required within 100 feet of dwellings and municipal areas. The acreage to be submitted to noise mitigation would be less than the acreage under Alternative C, but it is not measurable until FFO staff identify the locations of receptor points and the distance from each point that is subject to Noise Policy.

This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as under Alternatives A and B.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. Potential impacts would be much greater than under Alternative A because there would be 2,760 more wellhead compressors and 177 more large compressors in use over the 20-year

period. Implementation of the Noise Policy established in an NTL to oil and gas operators would provide localized noise mitigation within and near the designated areas.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

OHV Use

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts. Development of OHV management plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Specially Designated Areas

Under the proposed Noise Policy, noise mitigation within and around 16 SDAs and 45 areas with designated receptor points within them. The noise policy to protect nesting raptors would continue to minimize impacts.

Social and Economic Conditions

Employment

Employment in the oil and gas industry under this alternative would be similar to Alternative C. Regional changes in employment in the energy extractive industries would be minimal. There would likely be no loss of coal mining jobs under this alternative, as there would be under Alternative C. This would therefore minimize potential for local impacts

on coal mining-dependent labor pools. Overall, there would be a slight gain in job levels in extractive industries, but these would represent minimal increases for the planning area as a whole.

Expenditures

Expenditures under Alternative D would be similar to Alternative C and current expenditures for the oil and gas industry. The estimated cost for drilling 9,942 wells is \$5.3 billion, at an average cost of about \$536,000 per well. Additional direct costs would increase the total investment to about \$6.2 billion. Additional indirect expenditures could result in a total of \$7.9 billion spent over 20 years, or an average of \$399 million per year (non-escalated). This represents 130 percent increase in expenditures for oil and gas development on federal land compared to Alternative A and about 10 percent less than if current levels were maintained.

Revenues

Impact on tax revenues and royalties from oil and gas development would be essentially the same as under Alternative C. Over 20 years, production potential could more than double in the FFO area.

Under this alternative, coal production from existing mines on federal land may decline by 50 percent over the next 20 years. However, this could be offset by expanding deep leases at San Juan and La Plata mines. The resulting impact on coal royalties and taxes is not known, but would likely be minor, considering that coal revenues are currently only 5 percent of energy extractive industry revenues in New Mexico.

Impacts on grazing would be similar to Alternative B. Like Alternative C, the reduced acreage would reflect changed management prescriptions and therefore affect larger areas of contiguous land, which could affect some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. A slight reduction (about 3

percent) in permitted AUMs would somewhat decrease fees paid to the FFO and productive value of grazing. Although the value is small in relative terms, this loss could affect some smaller operators and may have a minor negative impact on local cattle ranching.

Environmental Justice

Impacts on minorities and low-income persons would be generally similar to those described for Alternative A. There would be no projected job losses; therefore, potential impacts on minority workers from loss of coal mining jobs under Alternative C would not result.

Change in OHV use on federal land under Alternative D may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

CUMULATIVE IMPACTS

The analysis of cumulative impacts focuses on the extent to which impacts from each alternative could combine with impacts from past, present, and future actions to create a significant adverse impact in the planning area. Past and present impacts are reflected in the existing conditions in the San Juan Basin in New Mexico. Analysis of future impacts includes the following considerations.

- The cumulative impacts identified in the RFDS for development of oil and gas on all land and from all mineral ownership types within the planning area, including the FFO area, AFO area, USBR lands around Navajo Reservoir, USFS lands in Carson and Santa Fe National Forests, Indian land, and state and private land.
- The cumulative effects of implementing the proposed changes to land use management in the FFO area in combination with other reasonably foreseeable actions.

This analysis is more general than the analysis of direct and indirect impacts because decisions about other actions in the planning area would be made by many public and private entities, and the location, timing, and magnitude of these actions are not well known.

Surface Disturbance Due to Oil and Gas Development

The predicted acreage of current and future disturbance due to oil and gas development on non-federal minerals under each alternative was combined with the current and future disturbance on federal minerals to estimate cumulative surface disturbance in the planning area. The 1991 Oil and Gas Leasing and Development Amendment (BLM 1991a) estimated the impacts of an additional 4,512 wells as 28,750 acres at that time. However, those numbers have been exceeded and disturbance incurred prior to this amendment was not quantified in that document. Abandoned locations that are waiting for

reclamation approval currently contribute to the total area of surface disturbance not associated with active wells. Specific data describing current surface disturbance are not available, so a broad estimate was made by adding the predicted amount of surface disturbance associated with each alternative to an estimate of the disturbance associated with approximately 18,000 active wells in the New Mexico portion of the San Juan Basin, using the same assumptions as described at the beginning of this chapter. The 3-acre average for well pads was used, and estimates for large pipeline and compressor construction were scaled in proportion to the amount of disturbance predicted in the RFDS. The resulting amount of long-term surface disturbance associated with current facilities producing federal minerals is broadly estimated at approximately 83,500 acres.

The RFDS projects a total of 12,461 wells to be developed over 20 years in the San Juan Basin (assuming 25 percent dual completions and commingling), of which 80 percent would be constructed to extract federal minerals. The cumulative impacts from the additional 2,491 wells that would be developed on non-federal minerals, was estimated assuming the same rate of commingling and dual completions as described for federal minerals. Based on the assumptions used to calculate surface disturbance for new wells and associated facilities, described under Assumptions for Analysis at the beginning of Chapter 4, there would be approximately 8,300 acres of long-term surface disturbance from construction of well pads, 80 large compressors, and large pipelines.

The net acreage of surface disturbance associated with projected new oil and gas development under Alternative D on all mineral ownership in the San Juan Basin would be almost 27,000 acres, as shown in **Table 4-21**. In combination with current surface disturbance, there would be approximately 110,400 acres or 4.8 percent of the land in the high development area (1.3 percent of all land) that would be affected by oil and gas construction

within the New Mexico portion of the San Juan Basin.

Development of federal and non-federal minerals under Alternative A would result in long-term disturbance of approximately 9,300 acres. In combination with current surface disturbance, there would be almost 92,800 acres or 4 percent of the land in the high development area (1.1 percent of all land)

disturbed. Under Alternative B, almost 117,000 acres or 5 percent of the land within the high development area (1.4 percent of all land in the planning area) would be affected when adding current and projected new oil and gas development. Alternative C would result in nearly the same acreage of long-term surface disturbance as Alternative D.

Table 4-21. Net Surface Disturbance from Oil and Gas Development on All Mineral Ownership

Surface Disturbance	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
New Development on Federal Minerals	934	24,781	18,238	18,577
New Development on Non-Federal Minerals	8,353	8,353	8,354	8,354
Subtotal of New Development	9,287	33,134	26,592	26,931
Existing Surface Disturbance	83,500	83,500	83,500	83,500
Total Surface Disturbance	92,787	116,634	110,092	110,431

Note: In some cases, acreage varies for the same number of wells due to rounding.

Under Alternative D, there would be approximately 44,300 acres of initial, short-term surface disturbance on land with federal and non-federal minerals caused by projected new wells, roads, and small pipelines constructed for oil and gas production in the high development area. Approximately 200 miles of new roads that would be added to

accommodate the new well pads projected on non-federal minerals. The total miles of new roads on both federal and non-federal minerals in the high development area would be 9 percent under Alternative D and would increase the road density to just over 3 mi/mi² if all existing roads remain open (**Table 4-22**).

Table 4-22. Existing and New Roads in High Development Area

	Alternative A	Alternative B	Alternative C	Alternative D
New Roads on Federal Minerals (miles)	358	1075	797	805
New Roads on Non-Federal Minerals (miles)	202	202	202	202
Existing Roads (miles)	10,083	10,083	10,083	10,083
Total Road Miles	10,643	11,360	11,082	11,090
New Roads as Percentage of All Roads	5%	11%	9%	9%
New Road Density (miles/mile ²)	2.93	3.13	3.05	3.06

Note: In some cases, acreage varies for the same number of wells due to rounding.

Under Alternative A, there would be a total of 21,800 acres of initial, short-term surface disturbance on federal and non-federal wells, roads, and pipelines in the high development area. The total miles of new roads on both federal and non-federal minerals in the high development area would be 5 percent and would increase the road density to 2.9 mi/mi² if all existing roads remain open.

Under Alternative B, there would be a total of 49,800 acres of initial, short-term surface disturbance. The total miles of new roads on both federal and non-federal minerals in the high development area would be 11 percent and would increase the road density to over 3.1 mi/mi² if all existing roads remain open.

Initial short-term surface disturbance under Alternative C (39,300 acres) would be slightly less than under Alternative D in the high development area, but the amount of new roads and the road density would be almost the same.

Other surface disturbance would be expected to occur in the vicinity of urban areas, as municipalities increase in population. As existing coal mines expand, there would be surface disturbance that would be offset by reclamation unless new mines are opened in addition to the current mining operations. Because the coal mining industry is volatile and subject to market conditions, it is impossible to predict the location and amount of coal mining that would occur in the San Juan Basin over the next 20 years.

Geology and Minerals

Hydrocarbon reserves would continue to be depleted from the formations in the basin under all alternatives and the loss of this resource is permanent. Recent gas production has been dominated by the Fruitland Coal formation. Its production trend is still increasing, and a stable trend has not yet been established. The three major conventional gas-producing formations, the Mesaverde, Dakota, and Pictured Cliffs, appear to have entered the late depletion stage (Engler et al. 2001).

Impacts on salable minerals would continue to occur and would most likely increase as construction of roads and buildings increase to meet the demands of a growing population. Sand and gravel quarries would be likely to be developed or expanded near the tri-cities area and other population centers, such as Cuba, Gallup, and Grants. There is no foreseeable demand for extracting locatable minerals during the next 20 years.

Soils

The cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities. Reclamation of P&A wells and closure of roads and pipelines would reduce the overall impacts by grading and stabilizing those areas so they are no longer contributing to erosion and sedimentation. Many additional construction activities are anticipated to occur over the next 20 years, especially in the vicinity of expanding urban areas.

It is not possible to predict the quantity of soil erosion and compaction that would result from OHVs and other surface disturbing activities in the San Juan Basin because enforcement of regulations would be a critical factor to control the amount and effect of this type of public activity on federal land. OHV access on private and state land varies across the San Juan Basin. It is known, however, that OHV traffic contributes to accelerated erosion and sedimentation, and that fewer limitations on cross-country travel would be expected on most non-federal land. It is likely that, if limitations on OHV travel are implemented on public land as proposed under Alternative D, there may be an increase in the use of OHVs across the landscape on non-federal land. This could result in moving the problem from public to non-public land, and could continue to contribute to soil erosion.

Water Resources

The primary cumulative impacts on water quality would result from an increase in the

amount of surface disturbance due to increased oil and gas development activity and other earthmoving activities associated with urban expansion in the planning area. This surface disturbance and increased sediment yields, along with an increase in roads that would direct sedimentation to stream crossings, would occur mainly in the high development area. Other vegetation damaging practices, such as OHV use cross-country and in drainageways, overgrazing, and vegetation management on non-public land, could contribute to increased sedimentation.

Water needed for well drilling on non-federal minerals would be approximately 1,800 acre-feet, using the same assumptions (5600 barrels/well) as described under each alternative. The total quantity of water needed to drill wells on federal and non-federal minerals over the 20-year planning period would be almost 8,750 acre-feet under Alternative D, almost 4,850 acre-feet under Alternative A, almost 11,100 acre-feet under Alternative B, and almost 8,700 acre-feet under Alternative C.

As population increases in the planning area, domestic water consumption would also increase, but no data are available to quantify the amount.

Air Quality

The project near-field dispersion modeling analysis considered the impact of both project emissions and existing emission sources within the planning area. Existing sources were simulated with the use of the highest amount of background pollutant data monitored in the planning area. It is possible that with the increase in gas production associated with the RMP and population growth in the Four Corners region, future background pollutant levels in the region could increase above current levels and those assessed in this EIS. However, as part of the NMAQB air permitting process, RMP sources that require near-field dispersion modeling analyses would consider the cumulative impact of proposed and surrounding future sources to ensure that they

would not contribute to an exceedance of an ambient air quality standard.

The project far-field analysis estimated that a conservative scenario of emissions would marginally increase ambient NO_x levels within nearby Class I areas. The majority of the emissions sources would be exempt from a Class I increment analysis under NMAQB regulatory requirements. Nevertheless, emissions from the combined RMP sources in future years would produce elevated levels of NO_x within nearby Class I areas that would be potentially significant. The combination of NO_x emissions from proposed RMP sources and future non-project sources in the region also would produce potentially significant cumulative impacts to nearby Class I areas.

The project far-field analysis also determined that emissions from the combined RMP gas development would have the potential to significantly impair visibility within the Mesa Verde National Park. As a result, the impact of project emission sources, in combination with reasonably foreseeable future emission sources, would potentially produce significant cumulative impacts to visibility resources in this pristine area.

The impact of the RMP emissions would be potentially significant to ambient 8-hour O₃ concentrations within the San Juan County project region. Additionally, the impact of RMP emissions with reasonably foreseeable future emissions would produce potentially significant cumulative impacts to ambient O₃ levels in the project area.

Upland Vegetation

Land disturbance and removal of vegetation would occur during oil and gas development on land with non-federal minerals, in addition to the acreage affected by federal minerals development described above. It is assumed that, on land with non-federal minerals, there would be an increase of 25 percent of the development projected for federal minerals under each alternative. The cumulative impacts on upland vegetation would equal the current disturbance (83,500

acres) plus the projected short-term surface disturbance on land with federal and non-federal minerals. In most cases, the native vegetation would not recover during the 20-year planning period, even if some areas were revegetated, so the total acreage of affected vegetation would be calculated by adding the initially disturbed acreage to the acreage of existing surface disturbance.

Following the above procedure, it is estimated that the cumulative impacts on native vegetation on all land affected by oil and gas development would total approximately 128,000 acres or 5.5 percent of the high development area under Alternative D. The range of cumulative impacts would be 105,000 acres (5.7 percent of the high development area) under Alternative A to 133,000 acres (5.7 percent of the high development area) under Alternative B. The piñon-juniper woodlands and Great Basin Desert Scrub would be the major plant communities most affected by impacts from oil and gas development.

Proposed changes in the locations of permitted cross-country OHV travel may cause impacts on vegetation to be moved from federal to non-federal land, if Alternative D were implemented. The overall impacts on vegetation in the San Juan Basin may be the same under all alternatives, but the effects would occur in different locations, depending on the alternative.

Riparian Areas and Wetlands

Specific protection of riparian areas and wetlands proposed in the San Juan Basin would occur on federally managed land. The designated Riparian Areas that would limit surface disturbing activities, such as oil and gas development, OHV cross-country travel, and grazing, are under the management of the FFO. Restrictions on construction in waterways and wetlands would be required on all land in the San Juan Basin to meet the requirements of the Clean Water Act and its associated permits (404/401) but the actual impacts on non-federal land cannot be predicted. It is possible that some riparian vegetation on non-federal

land in the planning area would be damaged by OHV traffic, grazing, and oil and gas development, but the extent and location of these impacts cannot be determined. The acquisition of inholdings within the expanded Riparian Areas in the FFO would mitigate some of this damage by bringing additional land under federal management with a goal of protecting important riparian and wetland resources.

As urban development and oil and gas development increases over the 20-year planning period, it is anticipated that there would be impacts to riparian areas and wetlands from erosion, sedimentation, and damage to vegetation in addition to those impacts described for federal land. However, the location and amount of these impacts and their direct effects on riparian areas and wetlands cannot be specified.

Special Status Species

All actions authorized by the federal government must comply with the ESA of 1973 as amended. FFO has developed management strategies to protect and conserve species and habitats for species that are listed as threatened, endangered, or proposed for listing. In addition, FFO provides special management for seven sensitive species that are not listed under ESA, and reviews sensitive species lists from other agencies. FFO cooperates with other agencies to develop protocols and protective management for other sensitive species, when appropriate. However, the protections listed above and discussed in the RMP apply only to actions in the planning area that are authorized by the FFO.

Impacts to threatened, endangered, proposed, or other sensitive species may occur on private lands with the project area. Private land is concentrated in the river valleys. Much of the private land in the river valleys has been cleared and is used for housing development and agriculture. Private lands in the uplands may be developed for housing or ranchette subdivisions and grazing operations. Most farming operations depend on irrigation water

supplied from the area rivers and may result in lower flows in the river during dry years. The development of private land may result in the loss of riparian, river valley, and upland habitats that may support rare species. Oil and gas development occurs on private lands/private mineral properties that may impact rare species. Gravel mining on private lands along the rivers has the potential to impact rare species and riparian habitats. FFO has no authority to regulate private land development, and the amount and type of development that may occur on private land in the future is independent of the RMP planning process.

Approximately 2.5 percent of the projected wells will be developed on Navajo Nation surface with federal minerals. The Navajo Nation maintains an autonomous T&E species program and coordinates with BLM to include protective measures and mitigation, to drilling permits to avoid negative impacts to sensitive species. Other Navajo Nation and Jicarilla Apache land with Indian minerals is developed through a tribal T&E species program and coordinated with the BIA. Approximately 7.5 percent of the projected wells will be developed on USFS land. The USFS maintains a T&E program to analyze impacts to T&E species on their surface. The State of New Mexico lands with state minerals are developed under the supervision of the NMOCD.

Fisheries and Wildlife

Wildlife inhabiting the piñon-juniper woodlands and Great Basin Desert Scrub would be the most affected by cumulative impacts. The existing surface disturbance from oil and gas operations plus projected disturbance described under each alternative, in combination with additional disturbance on non-federal minerals, would result in increased direct loss of habitat, habitat fragmentation, and functional habitat loss. The development of new wells on non-federal land would affect wildlife such as mule deer, elk, and antelope through the building of more roads and increased human activity. These increases in road density in the high development area,

when considering the existing roads and the new roads projected on land with federal and non-federal minerals (Table 4-22), would be likely to increase the functional habitat loss for many species of wildlife. The greatest such loss would occur under Alternative B, with slightly fewer impacts under Alternative D due to slightly lower predicted road density by the end of the 20-year planning period. The effects of loss of habitat on non-federal land adjacent to federal land would be most pronounced for species with large home ranges that overlap both federal and non-federal land (mule deer, elk, antelope).

Negative impacts on wildlife from OHV cross-country travel would occur where permitted throughout the San Juan Basin and would be compounded if all BLM land were to remain open to OHV access as it is currently managed (Alternative A).

Wilderness

Cumulative impacts from other foreseeable development (mostly of fluid minerals and coal) on non-federal lands could indirectly affect the periphery of Bisti/De-na-zin WA and Ah-shi-sle-pah WSA through visual changes, noise, dust, and additional vehicular activity in surrounding areas. Both these protected areas overlap with coal resources. Over the next 20 years, some mines will be depleted and closed and new mines could come into production. New rail infrastructure could be part of future coal development. Railroad ROWs would likely involve a variety of federal, state and private land and would therefore be subject to NEPA review. Possible designation of Cabezon WSA as a WA would expand wilderness resources regionally.

Rangeland

Much of the land in the San Juan Basin is considered to be suitable for livestock grazing. Although oil and gas development on land with non-federal minerals could add another 25 percent to the amount of surface disturbance predicted for land with federal minerals under each alternative, it would only affect about 1.6

percent of the San Juan Basin. Added to other surface disturbance from urban development and other construction, the overall effect of removing rangeland acreage from production would still be minimal when compared to the acreage of available forage. The impacts would be concentrated in the high development area and would be most significant for ranchers who graze livestock where the highest density of oil and gas development exists.

Other forage damaging activities such as OHV traffic and grazing on USBR and USFS land would continue to be controlled by agency policies. The USFS strictly controls OHV access and manages rangeland by controlling livestock AUMs. Private landowner controls on OHV access, weed management, and rangeland health are variable, so the future impacts on rangeland caused by foreseeable actions in the San Juan Basin are unpredictable. Conflicts between livestock grazers and other land users will continue to occur throughout the planning area.

Lands and Access

The cumulative impacts of actions to acquire and dispose of federal lands should generally favor community development and protect valuable resources. BLM would remain open to suitable proposals under the R&PP Act under any alternative. The development of oil and gas resources in the region is a key component of the economy. Higher levels of new development in the vicinity of urban areas could bring conflicts with residential, community, and some commercial uses, mostly from potential noise sources. These conflicts would likely be most prevalent under Alternative B. Local zoning plans and regulations would provide the basis for controlling incompatible land uses in these areas and should be developed accordingly.

Coordinating and consolidating the use of utility corridors for a variety of users and infrastructure would reduce the potential for a proliferation of bisected land holdings. By concentrating these linear uses, it would preserve flexibility for larger blocks of land for

future uses. Under Alternatives C and D, the Western Region Corridor Plan would be adopted and would support better coordination of regional infrastructure and use of common corridors. Approximately 140 miles of additional corridors in the planning area proposed by Public Service Company of New Mexico (PNM) in their 20-year plan could contribute to fragmentation of land holdings, and bisect land use patterns. This trend could be reduced by coordinating corridor siting among all users.

Growth in the region is expected to increase traffic on most roadways. Ongoing and future state and federal highway projects are expected to address major transportation needs. Local effects from production on federal land on US 550, US 64, and US 173 may be considerable.

Visual Resources

On a regional basis, modifications in the landscape will continue as oil and gas resources are developed. Potential for future development on non-federal land will also contribute to visual modification. Within the planning area, standards for mitigating visual impacts are only applied on federal land. It is therefore expected that human modifications will become increasingly noticeable in the landscape. Cumulative impacts on visual resources would be greatest under Alternative B, in which oil and gas development on federal land would represent the largest portion of new development, and cross-county OHV use would continue to affect wide areas. New coal mines in the Four Corners region would also potentially have significant local impacts on sensitive landscapes. Linear features such as new railroad for coal development, oil and gas field roads and pipelines, and other major utility corridors, such as PNM's proposed corridors, could be noticeable manmade features that slowly change the landscape from predominantly natural to more evidently modified. Consolidating major infrastructure into a few corridors would minimize potential changes on a widespread basis. This could be

accomplished through regional planning and coordination.

Cultural Resources

The acreage of initial, short-term surface disturbance on land with federal and non-federal minerals, described under the cumulative impacts in Watersheds above, would vary between alternatives. The greatest potential for impacts to archaeological sites and TCPs would occur under Alternative B because the most wells, roads, and pipelines, disturbing 49,800 acres, would be constructed on federal and non-federal minerals. Alternative D would have slightly less disturbance, 44,300 acres, and therefore slightly less potential for impacts to cultural resources.

An additional 200 miles of new roads on non-federal minerals, added to existing roads and those projected to access federal minerals would affect a greater amount of cultural resources through direct damage and could result in increased vandalism, when considering all oil and gas activities, in combination with surface disturbance and road construction from other possible urban development in the San Juan Basin. There are more recorded sites on federal land than on land under other ownership, and fewer requirements for documenting or avoiding cultural resources on private land, so the surface disturbance caused by all development would result in a greater potential for damage to cultural resources where they are not protected by the enforcement of regulations.

Paleontology

More surface and subsurface disturbance would affect a greater amount of paleontological resources when considering the amount of oil and gas activities on federal minerals, in combination with development on land with non-federal minerals, and disturbance from other construction activities in the San Juan Basin. Excavation, drilling, and OHV traffic that would occur on non-federal land would result in a greater potential for damage to paleontological resources because they are

not as well protected by the enforcement of regulations.

Recreation

Cumulative impacts are most likely to occur on dispersed recreation throughout the region. Management of SDAs would generally preserve some of the most favored public recreation areas. Under Alternatives C and D, widespread oil and gas development would add to the level of modification (primarily visual and sound) in the environment that detracts from high quality dispersed recreation. However, expansion of recreation areas would provide some offsetting protection for locations that have the greatest appeal for recreation. Limitations on cross-country OHV use may increase cross-country OHV use on private land. Alternative B would have the greatest potential for cumulative impacts on recreation from high levels of oil, gas, and possibly coal development, and relatively little expansion of specially delineated recreation areas. Under Alternative A, loud and damaging use of OHVs over widespread areas would continue and increase throughout the planning area, as population and popularity of motorized sports increases. Although modifications from oil and gas development (to visual and sound qualities) would be somewhat less than under Alternative A, there would be no expansion of areas protected or facilities provided to meet growing demands for recreational purposes. Overall, Alternatives C and D provide the greatest balance in managing for recreational resources in the planning area.

Noise

Due to the relatively small areas and localized impacts of implementing the Noise Policy, most of the planning area would be exposed to increased noise from oil and gas activities under all alternatives, although they would be less under Alternatives C and D. This exposure would increase in areas of non-federal minerals where oil and gas development occurs, as well as on federal lands not within designated NSAs.

Social and Economic Conditions

Cumulative economic impacts would arise, primarily from additional oil and gas development on federal and non-federal land in the planning area. Annual oil and gas production could more than double over current levels under Alternatives B, C, and D, and increase by about one-third for Alternative A. Coal production in the Four Corners area is not expected to increase significantly over the next 20 years (Hill and Associates 2000), and employment levels are likely to remain at current levels. Oil and gas facilities may displace some grazing, scattered widely over the planning area. This may account for relatively minor reductions in permitted grazing levels, which would have insignificant cumulative impacts.

There would be additional economic benefits in the form of jobs, expenditures, and public revenues from oil and gas development of non-federal minerals. Additional new non-federal development is estimated to generate about 560 additional jobs annually at the end of 20 years. In the local tri-cities area, new oil and gas industry jobs (both federal and non-federal mineral) generated under Alternatives B, C, and D could represent increases of about 2 to 4 percent over current employment levels and have a minor beneficial effect on the local economy, with federal development accounting for about one-half to three-quarters of this benefit. Regionally, job increases (and earnings) or losses (Alternative D only) would range from 1 to 2 percent of current levels and would be insignificant in the long-range timeframe.

An estimated \$2 billion in direct and indirect expenditures would produce an average annual expenditure of \$98,600,000. This would increase expenditures expected under Alternative A by 50 percent, and would represent about a 20 percent increase annually over Alternative B and 25 percent over Alternatives C and D.

Taxes and royalties could increase in proportion to annual production (see above). A progressive increase over the long-term is expected under all alternatives, with the least gain under Alternative A. Benefits to the state, local jurisdictions, and school districts could result, assuming value of the product does not decline.

Overall, the effect of oil and gas development on land with non-federal minerals over 20 years would benefit economic activity in the planning area. These are expected to far outweigh any changes in jobs, expenditures, or revenues resulting from any other actions expected or likely in the region.

Environmental Justice

In a region where lower paying jobs in retail and service industries have been increasing at a faster rate than others, and where employment fluctuates in bust and boom cycles of the energy industry, continued development of energy resources represents a desirable economic engine, even if it remains subject to cycles. Because these resources are concentrated in Rio Arriba and San Juan counties that both have disproportionately minority population, benefits from growth in resource development both of federal and non-federal interests would provide jobs and therefore benefit these groups. The greatest economic benefit may occur under Alternative B, however, this level of development also has the greatest potential for increasing the level of conflict between extractive operations and other land uses, such as residential, throughout the planning area. These incompatibilities could occur widely and affect residents in the planning area, including low-income and minority groups. Development on non-federal land would need to comply with requirements of local jurisdictions or tribes. Where local controls are minimal, there would be increasing possibility for incompatible development.

MITIGATION AND MONITORING

Mitigation Measures

For the majority of activities occurring on public lands in the planning area, mitigation is implemented via COAs for activities related to and occurring on oil and gas leases and special stipulations, which are attached to grants for rights of way. Similar stipulations are attached, when appropriate, to non-oil and gas related surface disturbing activities. Application of mitigating measures is determined on a site-specific basis. The following section summarizes, by resource, the major mitigating measures typically used to reduce impacts from surface disturbing activities. Mitigation measures listed under one resource may also apply to others. For example, the requirement for reseeding disturbed areas can, depending upon the situation, serve to mitigate impacts to soil, water, air, vegetation, wildlife, visual, and rangeland resources.

Many of these mitigating measures can be linked to BMPs. BMPs cover a broad variety of practices used to reduce or eliminate non-point pollution sources. They can include measures such as reestablishment of vegetation, mulching, terracing, or other activities that reduce raindrop impact, reduce the velocity of or divert runoff, protect the structural integrity of soils, filter contaminants and sediment to protect surface water, and increase water infiltration. The mitigation measures that serve as BMPs are designed to meet the needs of each site and situation.

The following list is not all-inclusive. Many of the measures are abbreviated or summarized from the more extensive list of existing COAs, special stipulations, and other mitigation measures included in Appendix G. Mitigating measures can be added or modified as conditions change or new information and techniques become known.

Soils

Various techniques are employed to reduce soil erosion. Most measures focus on reducing the amount of surface disturbance, protecting

disturbed soils from water or wind erosion, and restoring natural vegetation as soon as possible. Depending upon the site-specific situation, major mitigation measures to be employed include the following:

- Operators are required to submit a plan of reclamation to the BLM.
- Clearing, grading, and other disturbance of soil and vegetation is limited to the minimum area required for construction.
- Any roads used exclusively for construction purposes shall be adequately closed to all vehicular travel and rehabilitated after completion of construction.
- Topsoil removed during construction will be stockpiled and used in reclamation (see p. G-9, No. 39.)
- Sidehill cuts of more than 3 feet vertical are not permitted. Areas requiring cuts greater than this will be terraced so none are greater than 3 feet.
- Disturbed areas shall be mulched as designated by the Authorized Officer (see p. G-9, No. 65)
- Disturbed areas will be reseeded following specifications using designated seed mixtures within one year of final construction.
- No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet to work.
- See also p. G-1, No. 4; p. G-2, No. 14, 16; p. G-3, No. 23, 24; p. G-4, No. 28; p. G-6, No. 13; p. G-7, No. 14, 19, 20; p. G-9, No. 34, 38, 39, 40, 41; p. G-10, No. 42, 43; p. G-11, No. 55, 56, 60, 63; p. G-15, all.

Water Resources

In addition to those measures listed under Soils, the following mitigation measures will be applied as appropriate to protect both surface and groundwater from the impacts of surface disturbance:

- Drilling pits will be lined with an impervious material at least 8 mils thick.
- Mud and blow pits will be constructed so as not to leak, break, or allow discharge of liquids or produced solids (see p. G-13, No. 3).
- Washes shall be diverted around well pads.
- Culverts of sufficient size (minimum 18 inches) will be placed where drainages cross access roads.
- Low water crossings shall be constructed in a manner that will prevent any blockage or restriction of the existing channel. Material removed shall be stockpiled for use in rehabilitation of the crossing.
- Full compliance with all applicable laws, regulations and Onshore Orders is required. (Onshore Order No. 2 requires protection of all useable aquifers when casing and cementing oil and gas wells.)

Air Quality

The recent concerns in the San Juan Basin focusing on ozone levels and ozone precursors (which are also contributors to regional haze) have caused concerned citizens, agencies, local governments, and industry to form the Four Corners Ozone Task Force. Working in conjunction with the Task Force steering committee, the NMAQB has identified the need for additional inventory, monitoring, and modeling which are required in order to recommend the most effective air quality mitigation measures. The BLM is a member of the steering committee and will support the state in its monitoring and modeling efforts. The BLM is obligated to approve only those operations that are in compliance with

applicable laws and state standards. When specific Task Force recommendations for mitigation are made, the BLM will incorporate as mitigation measures those recommendations that are within its legal authority to require. In the interim, industry is encouraged to employ appropriate technology to limit emissions.

Gas Well Development

Gas well development would produce air quality impacts from combusive equipment, fugitive dust emissions from earthmoving activities, and the operation of vehicles on unpaved and paved surfaces. These activities are expected to produce less than significant air quality impacts within the planning area.

Other mitigation measures specific to air quality to be implemented as dictated by site-specific conditions include the following:

- Cover all truck hauling soil, sand, and other loose material
- Furnish and apply water, chemicals, or use other means satisfactory to the Authorized Officer to minimize dust. In certain specific instances, produced water may be used for dust suppression.
- When appropriate, install windbreaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Exposed stockpiles of dirt or sand will be enclosed, covered, or have non-toxic soil binders applied.

Gas Production Sources

The project air quality impact analyses concluded that emissions from proposed gas production sources would, if not mitigated, produce potentially significant impacts to the following air quality levels:

- Near-field 24-hour NO₂ concentrations,
- Class I area NO₂ increments,
- Class I area visibility, and

- Regional ambient O₃ levels.

The overwhelming majority of NO_x emissions from proposed gas production sources would occur from wellhead compressors. These relatively small sources generally are unregulated by the NMAQB permitting process unless they are accumulated as part of a large facility with other substantial emission sources. Central compression units that would occur as part of the development of project alternatives generally would be regulated under NMAQB Construction Permits, Title V Operating Permits, or the PSD regulations. Therefore, the main opportunity to reduce project operational air quality impacts would occur from implementation of measures to control proposed wellhead compressor NO_x emissions through this NEPA process.

The near- and far-field modeling analyses evaluated wellhead compressors with a NO_x emission factor of 15.8 gm/HP-hr. The annual emission calculations for the proposed wellhead compressors were based on an average NO_x emission factor of 13.2 gm/HP-hr, as determined from NMAQB source test data of 12 natural gas-fired engines ranging in size from 65 to 145 HP. Half of these units had NO_x emission factors of less than 10 gm/HP-hr and the lowest NO_x emission factor of these 12 units was 4.1 gm/HP-hr. Therefore, these source test data show that current engine designs are capable of producing NO_x emissions that are less than what was analyzed in this Proposed RMP/Final EIS. Advancements in engine designs are also expected to improve emission rates from small natural gas-fired engines manufactured in future years.

Add-on control technologies, such as catalytic converters, can reduce NO_x emissions from natural gas-fired wellhead compressors by up to 95 percent from uncontrolled levels, if they are working properly. Catalytic converters that reduce NO_x emissions can also reduce VOC and CO emissions by similar amounts. The cost of these devices for the Caterpillar 3304 engine is about \$3,000 (the cost of the 3304 engine ranges from \$16-20,000)

(Kaufman 2002). More inexpensive catalytic converters can still provide substantial NO_x emission reductions. While cost-effective technologies exist to minimize NO_x emissions from wellhead compressors, they must be maintained to ensure their efficacy.

One interim mitigation measure would be to limit the NO_x emission factor of any proposed wellhead compressor to less than 10 gm/HP-hr. Implementation of this measure would reduce NO_x emissions estimated for Alternative B by about 22 percent and would substantially reduce project impacts to the four air quality levels of concern identified above. Since the project region within San Juan County is near the level of nonattainment of the NAAQS for 8-hour O₃ concentrations, BLM would encourage the use of lean burn compressor engines and add-on control devices on wellhead compressors. Additionally, the BLM would recommend the use of larger compression units that could simultaneously serve several wells. This would increase the chance that these units would be large enough to fall under permit review by the NMAQB, which could further reduce emissions from these sources.

Upland Vegetation

In addition to the measures already listed under Soils and Water Resources above, mitigation measures to protect or restore upland vegetation communities include the following:

- No hardwood tree with a diameter of 10 inches or more at the base or any ponderosa pine, Douglas fir, or aspen tree is to be removed or damaged without approval from the Authorized Officer.
- Use of pesticides and herbicides shall comply with applicable federal and state laws (see p. G-14, No. 8).
- Permit holder shall be responsible for weed control and selective control of invasive weeds on disturbed land and reclaimed areas within the limits of the

well pad, associated road, and pipeline ROW.

- Permit holder is responsible for consultation with the Authorized Officer and/or local authorities for acceptable weed control methods within limits imposed in the COAs.

Riparian Areas and Wetlands

- No development activity or surface occupancy shall be permitted in wetland areas (as defined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands) (US Army 1987). Exceptions may be analyzed in a site-specific environmental assessment. Any wetland acreage destroyed shall be mitigated by the acreage ratio as prescribed by the USFWS.
- A buffer strip of vegetation, width determined on a case-by-case basis, shall be left between areas of surface disturbance and riparian vegetation.
- Minerals under areas of critical concern along the San Juan River, and under or close to Navajo Lake, shall be developed using no surface occupancy and directional drilling. Exceptions may be granted on a case-by-case basis in consultation with appropriate agencies.

Special Status Species

- No surface disturbance shall be permitted in bald eagle core areas.
- No construction activities shall be conducted between November 1 and March 31 in bald eagle buffer zones, unless approved on a case-by-case basis.
- All proposed actions within unsurveyed suitable habitat for any proposed T&E (state or federally listed) species will require surveys according to the responsible agency's protocol. Restrictions will be placed on surface disturbing activities in suitable habitat until these inventories are complete. The absence of any T&E species must

be confirmed prior to approval of any surface disturbing action that may affect the habitat. If a T&E species is found, appropriate restrictions on new development will be imposed to avoid or mitigate adverse impacts.

- Mitigation for peregrine falcon nest sites will be determined on a site-specific basis using the principle of designating sensitive zones in which disturbance is seasonally restricted as delineated in Johnson 1994.
- When individual plants or suitable habitat for Brack's cactus are found during a biological survey for a ground-disturbing project, the company proposing the project will be required to transplant plants from the project area if well relocation or directional drilling are not feasible. Aztec gilia mitigation measures will be implemented on a case-by-case basis (see Appendix G).

Fisheries and Wildlife

In addition to the surface reclamation mitigation measures listed in the Soil, Water, and Upland Vegetation sections above, the following measures will be applied on a site-specific basis to mitigate impacts to wildlife and wildlife habitats:

- Seasonal restrictions are applied to prohibit surface disturbance in key habitats for deer, elk and antelope (see p. G-5, No. 3).
- Disturbance is restricted in designated elk calving areas from December 1 through July 14.
- Permanent or temporary pipelines for water disposal will be installed as early as possible to eliminate excessive truck traffic in sensitive wildlife areas. Exceptions may be considered on a case-by-case basis.
- All unguarded pits containing liquids will be fenced with woven wire. All fencing must be in accordance with New Mexico State Law.

- Unless otherwise agreed to by the Authorized Officer in writing, powerlines shall be constructed in accordance to standards outlined in “Suggested Practices for Raptor Protection on Powerlines” (Olendorff et al. 1981) (see p. G-6, No. 12).
- No construction, drilling, or completion activities shall be conducted between March 1 and June 30 in buffer zones surrounding active raptor nests.
- In key areas, where practical, well data may be required to be transmitted electronically to reduce vehicle traffic and wildlife disturbance.

Wilderness

To maintain the area’s suitability for preservation as wilderness, the FFO will manage Ah-shi-sle-pah WSA under the nonimpairment mandate required by law. Any activity proposed within the WSA would be required to meet the nonimpairment criteria listed in BLM Manual H-8550-1, Interim Management Policy For Lands Under Wilderness Review. If coal development is pursued near these areas, a thorough NEPA analysis would be warranted.

Rangeland

Various mitigation measures in the Soils, Water, Upland Vegetation, and Wildlife sections above also serve to mitigate impacts to the rangeland components essential for rangeland health. Additional mitigation measures that are intended to reduce impacts to livestock operators on the rangelands include the following:

- Prior to crossing, using, or paralleling any improvement on public land, the operator shall contact the owner of the improvement to obtain mitigating measures to prevent damage to the improvements.
- All cut fences are to be tied to H-braces prior to cutting. The opening will be protected as necessary during construction to prevent the escape of livestock (see p. G-4, No. 26).
- When construction activity in connection with a ROW breaks or destroys a natural barrier used for livestock control, gaps thus opened shall be fenced to prevent drift of livestock.
- The permit holder is responsible to contact the grazing lessee(s) prior to crossing any fence on public land or any fence between public and private land, and to offer the lessee(s) an opportunity to be present when the fence is cut to ensure the fence is adequately braced and secured.
- Cattleguards may be required when new roads cross existing fence lines (see p. G-8, No. 32).

Visual Resources

- Operators may be required, on a case-by-case basis, to leave a tree screen on one or more sides of a location.
- Above-ground structures are required to be painted in one of 5 colors designated to blend with the natural color of the landscape (see p. G-2, No. 15).
- Permit holders are required to coordinate with the Authorized Officer on the design and color of power poles and transmission lines to achieve minimal practicable visual impacts.
- Permit holders may be required to reconstruct rock rims as near as possible to the original (See p. G-13, No. 70).

Cultural Resources

- Discovery of Cultural Resources in the Absence of Monitoring: If, in its operations, an operator/holder discovers any previously unidentified historic or prehistoric cultural resources, then work in the vicinity of the discovery will be suspended and the discovery promptly reported to the BLM Field Office Manager. The BLM will then specify what action is to be taken.

If there is an approved “discovery plan” in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11

- *Discovery of Cultural Resources During Monitoring:* If monitoring confirms the presence of previously unidentified cultural resources, then work in the vicinity of the discovery will be suspended and the monitor will promptly report the discovery to BLM Field Office Manager. BLM will then specify what action is to be taken. If there is an approved “discovery plan” in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11.
- *Damage to Sites:* If, in its operations, operator/holder damages, or is found to have damaged, any previously documented or undocumented historic or prehistoric cultural resources, excluding “discoveries” as noted above, the operator/holder agrees at his/her expense to have a permitted cultural resources consultant prepare and have executed a BLM approved data recovery plan. Damage to cultural resources may result in civil or criminal penalties in accordance with the Archeological Resource Protection Act of 1979 (as amended).

Paleontology

- If in the conduct of operations, paleontological material (fossils) is observed, lessee shall immediately contact the BLM. Lessee shall cease any operations that would result in the destruction of such objects. Further

investigation will dictate site-specific stipulations for avoidance or salvage of any significant paleontological resources.

Noise

The Draft NTL concerning management of sound generated by oil and gas production and transportation (presented in Appendix E) will become final upon approval of the Final RMP. Equivalent language will be developed into a special stipulation to be applied to noise generating sources permitted by ROWs.

Roads

Construction and design of roads shall meet the standards specified in BLM Manual 9113 and the “Gold Book.”

Monitoring

A variety of monitoring studies are conducted in the FFO to assess the effectiveness of various management and/or mitigation strategies. The amount and extent of monitoring can vary from program to program based on funding and personnel availability. The following is a partial list of ongoing monitoring studies by major program.

Cultural Resources

- A site stewardship program employing volunteers is used to monitor cultural ACECs.
- Annual monitoring of Chacoan Outliers is conducted to detect natural changes as well as potential threats.

Recreation and Wilderness

- Recreation program personnel monitor organized events to ensure compliance with permit stipulations.
- The Ah-Shi-Sle-Pah WSA is monitored monthly as required by Bureau policy.

Wildlife

Wildlife Program personnel conduct the following monitoring studies to provide baseline information for use in impact assessment and evaluation:

- Studies on key browse species to assess the age, form class, and degree of hedging;
- Pellet group studies to assess deer days use and trend in elk use within key areas;
- Point count bird surveys within key habitat types;
- Helicopter surveys to monitor the trend in deer, elk, and antelope numbers;
- Vegetative cover and point count bird studies to monitor the effects of thinning, burning, and seeding in a piñon-juniper plant community;
- Macro-invertebrate and river substrate monitoring on selected portions of the San Juan River.

Special Status Species

Historical inventory and monitoring studies for Mesa Verde cactus, Knowlton's cactus, Mancos milkvetch, bald eagle, southwest willow flycatcher, Mexican spotted owl, and mountain plover are summarized in the BA prepared for the DRMP/EIS. Other species that have been inventoried or monitored include ferruginous hawk, prairie falcon, golden eagle, peregrine falcon, yellow-billed cuckoo and Aztec gilia. As funding and personnel commitments permit, appropriate monitoring of listed T&E species as well as other Special Status Species will continue.

Riparian

Riparian habitats in the FFO are monitored on a 3-year rotating basis to evaluate trends toward proper functioning condition.

Air Quality

Air quality monitoring falls within the authority of the State of New Mexico. The FFO will pursue funding to assist the NMAQB in establishing additional air quality monitoring stations.

Invasive Weed Management

Sites where weed control measures have been implemented will be monitored to assess

control effectiveness. Monitoring and mapping of invasive weed locations will occur as funds and personnel permit.

Rangeland

As personnel and funding permit, the rangeland monitoring plan will be implemented. Program personnel will monitor actual use, forage utilization, and rangeland trend. Precipitation data will also be collected.

Oil and Gas Related Surface Reclamation and Compliance

The BLM recognizes the problems associated with surface reclamation in the San Juan Basin. Many of these problems are a legacy of actions that began before present land use policies and regulations were in place. In order to address reclamation issues, the FFO has begun several initiatives including the San Juan Basin Roads Committee and the Rancher/Industry Working Group. Industry has begun voluntary contributions to an offsite mitigation fund which can be used to correct some of the problems associated with past unsuccessful reclamation efforts. The BLM believes that collaborative efforts involving industry and other stakeholders are essential to successful resolution of past reclamation problems.

In order to improve oversight of new projects, the FFO has increased its Inspection and Enforcement staff. Additionally, Petroleum Engineering Technicians will be cross-trained in surface protection topics. Industry is expected to fully comply with the surface protection and hazard reduction aspects of appropriate Onshore Orders as well as COAs and Standard Stipulations. Among the required compliance actions are stack protectors to exclude birds and bats, pit fencing, noxious weed control, and revegetation of well pads and ROWs.

A compliance plan for new well pads and ROWs will be developed by October 1, 2003. The plan will integrate existing initiatives and prioritize areas with outstanding problems. A timeline for correcting problem areas will be included, as will a strategy for assigning

adequate personnel to address the issue. Unless other resources can be brought to bear on the problem, additional time devoted to compliance may reduce personnel available for reviewing new projects. Key aspects of the Compliance Plan will include:

- All new surface disturbing actions will be in compliance with established standards. FFO will complete compliance checks on all new surface disturbance until the compliance rate achieves 95 percent.
- The compliance goal for old (pre-2003) actions will be to achieve full compliance within 10 years.
- The planning area will be subdivided into geographic units. Within each unit, the priority for pre-2003 actions will be assigned in the following order:
 1. Compliance on all actions within designated SDAs (with special emphasis on Angel Peak, Glade Run, and Simon Canyon) and other vulnerable areas (close proximity to Navajo Reservoir, rivers, major washes, areas of high cultural significance, close proximity to T&E species habitat);
 2. Compliance on all actions within close proximity of residences and towns, critical big game areas, areas of high watershed concern, areas of known past non-compliance issues;
 3. Inspection for Final Abandonment Notices and revegetation of plugged and abandoned well sites, roads, and ROWs;

4. Compliance on all actions within remaining areas of watershed or other resource concerns; and
5. Compliance on all remaining actions.

A database for compliance will be maintained by the BLM and progress toward meeting compliance objectives will be presented in an annual report available for public review.

Road Improvement

The program to improve existing roads and the development of transportation planning are based on road maintenance agreements. A total of 13 road management units have been established in the FFO area. The AFO will create a similar unit in the Lindrith area.

Transportation plans will be developed for each transportation unit. The goal for road improvement is to have all collector roads meet Gold Book standards within 10 years. An ongoing Department of Energy study in the AFO is examining potential new road standards specific to the geology and soils of the Lindrith area. If this study generates improved, practical standards with applicability elsewhere in the Basin, the FFO will work with the San Juan Basin Roads Committee to incorporate the new standards for appropriate areas.

An additional goal will be to bring all local roads into compliance with appropriate standards within 20 years. This will include identifying, closing, and reclaiming unneeded roads.

Problem roads will be addressed first, even if a transportation plan has not been completed for the unit in which the road occurs.

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CHAPTER 5

CONSULTATION AND COORDINATION

INTRODUCTION

During the planning process for this RMP/EIS, formal and informal efforts were made by the BLM to involve other federal agencies, state, local, and tribal governments, and the public. BLM initiated the planning process in September 2000 by requesting comments to determine the scope of the issues and the concerns that should be incorporated into the action alternatives and impact analysis. A Core Team of BLM, USBR, and USFS staff formed the interdisciplinary team that guided the identification of the issues and the development of the RMP/EIS project description and alternatives.

As part of the data collection and resource inventory process, FFO staff and consultants formally and informally contacted agencies to request information to supplement that provided by the BLM. This included information on fish and wildlife, special status species, and recorded archaeological site and survey data.

This chapter describes the formal consultation with agencies and tribes, the public participation activities and results, and the consistency of this document with other plans in the region. It also lists the next steps in the process, the agencies and organizations that received copies of the Draft RMP/EIS for review, and lists the individuals who prepared and reviewed the document. Comment letters received from reviewing agencies are included in their entirety at the end of this chapter.

CONSULTATION AND COORDINATION

Consultation with the USFWS is required under Section 7 of the ESA of 1973 prior to initiation

of projects by BLM that may affect any federally listed threatened or endangered species or habitat. Letters of formal consultation and notes from meetings of BLM, consultants, and USFWS biologists are on file in the FFO. The Final BA that evaluates the impacts of the proposed action on federal threatened and endangered species was delivered to USFWS on September 24, 2002. On October 2, 2002, the USFWS sent a memorandum confirming their concurrence with the effects determinations contained in the BA and concluding Section 7 consultation. A copy of this memo is included with the agency letters at the end of this chapter.

This plan is also consistent with legislation protecting state listed species. BLM and consulting biologists have contacted NMDGF staff, who reviewed the Draft RMP/EIS. Consultation with the state and federal agencies will continue throughout the RMP process and implementation of the plan.

The BLM cultural resource management program operates in accordance with 36 CFR Part 800, which provides specific procedures for consultation between the BLM and the SHPO. The SHPO has been consulted during the development of the RMP/EIS concerning cultural resources that may be affected.

In accordance with the NHPA, letters were sent to 51 different tribal governments and 29 other tribal officials in 2001 to inform them of the project. The letters also requested their input on issues and concerns that should be considered during the planning process and initiated efforts to identify and consider traditional cultural places. The recipients of these letters are listed in **Table 5-1**.

Table 5-1. Recipients of Tribal Consultation Letters

Tribe	Presiding Officer	Other Recipients
Hopi Tribal Council	Wayne Taylor, Jr., Chairman	Leigh Kuwanwisiwma, Director, Cultural Preservation Office
Jicarilla Apache	Claudia J. Vigil-Muniz, President	Melton Sandoval, Cultural Preservation Officer
Pueblo of Acoma	Cyrus J. Chino, Governor	Brian Vallo, NAGPRA Officer
Pueblo of Cochiti	Regis Pecos, Governor	
Pueblo of Isleta	Alvino Lucero, Governor	Lawrence Lucero, Lieutenant Governor
Pueblo of Jemez	Joe Cajero, Governor	Bill Whatley, Cultural Preservation Officer
Pueblo of Laguna	Henry D. Early, Governor	Victor Sarracino, NAGPRA Officer
Pueblo of Nambe	David A. Perez, Governor	Denise Perez, Secretary-Treasurer; Councilman Ernest Mirabel, NAGPRA Representative
Pueblo of Picuris	Charles Chile, Governor	Joe Quanchello, Cacique; Richard Mermejo, Lieutenant Governor
Pueblo of Pojoaque	Jacob Viarrial, Governor	Marcia Martinez, Governor's Secretary; Charlie Tapia, War Chief
Pueblo of San Felipe	Lawrence Trancosa, Governor	Bruce Garcia, Tribal Administrator
Pueblo of San Ildefonso	Perry Martinez, Governor	Myron Gonzales, Cultural Preservation Officer
Pueblo of San Juan	Wilfred Garcia, Governor	Herman Agoyo, Realty Officer
Pueblo of Sandia	Stewart Paisano, Governor	Jenny Holmes, Historic Preservation Office
Pueblo of Santa Ana	Bruce Sanchez, Governor	
Pueblo of Santa Clara	Denny Gutierrez, Governor	Alvin Warren, Rights Protection Officer
Pueblo of Santo Domingo	Ramon Garcia, Governor	
Pueblo of Taos	Nelson Cordova, Governor	Isidro Mirabel, War Chief
Pueblo of Tesuque	Charlie Dorame, Governor	Gary Moquini, Director, Parks and Wildlife
Pueblo of Zia	William Toribio, Governor	Celestino Gachupin, Natural Resource Department
Pueblo of Zuni	Malcolm Bowekaty, Governor	Jonathan Damp, Heritage and Historic Preservation Office
Southern Ute Tribe	Leonard C. Burch, Chairman	Michael Olguin, Natural Resource Director; Everett Burch, Cultural Preservation Division Director
The Navajo Nation	Kelsey A. Begaye, President	Dr. Alan Downer, Director, Historic Preservation Department
Ute Mountain Ute Tribe	Ernest House, Chairperson	Terry Knight, Tribal Culture Representative

Navajo Chapters	Recipient
Baca Chapter	Rosita Loretto, Coordinator
Becenti Chapter	Juliette Largo, Coordinator
Casamero Lake Chapter	Sharon Wellito, Coordinator
Church Rock Chapter	Leonard Francisco, Jr., Coordinator
Counselor Chapter	Gloria C. Lee, Coordinator
Hogback Chapter	Sara H. Sandoval, Coordinator
Iyanbito Chapter	Jerry L. Frank, Coordinator
Lake Valley Chapter	Etta P. Tso, Coordinator
Little Water Chapter	Tim C. Morgan, Coordinator
Mariano Lake Chapter	Raquel Warber, Coordinator
Nageezi Chapter	Rory Jaques, Coordinator
Nahodishgish Chapter	Eddie F. Morgan, Coordinator
Nenahnezad Chapter	Clarence Hogue, Jr., Coordinator
Ojo Encino Chapter	Elizabeth Stoney, Coordinator
Pinedale Chapter	Louise M. Mariano, Coordinator
Pueblo Pintado Chapter	Sammie Jim, Coordinator
Rock Springs Chapter	Harriett K. Becenti, Coordinator
San Juan Chapter	Rita Slim, Coordinator
Shiprock Chapter	Marilyn Garcia, Coordinator
Smith Lake Chapter	Jackson Gibson, Coordinator
Standing Rock Chapter	Ray C. Billy, Coordinator
Thoreau Chapter	Julia Martinez, Coordinator
To'Ha'ji'lee Chapter	Glen Begay, Coordinator
Torreon Chapter	Wally Toledo, Coordinator
Tsayatoh Chapter	Charles Morrison, Coordinator
Twin Lakes Chapter	Dorothy Denetclaw, Coordinator
Upper Fruitland Chapter	Jimmy Blueeyes, Coordinator
Whitehorse Lake Chapter	Bobby Tsosie, Coordinator
Whiterock Chapter	Robert Martin, Coordinator

CONSISTENCY WITH OTHER PLANS

The BLM planning regulations require that RMPs be “consistent with officially approved or adopted resource-related plans, and the policies and procedures contained therein, of other federal agencies, state and local governments, and Indian tribes, so long as the guidance and

RMPs are also consistent with the purposes, policies and programs of federal laws and regulations applicable to public lands...” (43 CFR 1610.3-2). In order to ensure such consistency, finalized plans were solicited from federal, state, and local agencies and groups, as well as from tribal governments.

There are no known inconsistencies between any of the alternatives and other officially approved and adopted resource-related plans of other federal agencies, state and local governments, and Indian tribes. The plan is also consistent with previously developed recovery plans such as the Mexican Spotted Owl Recovery Plan (USFWS 1995), Habitat Management Plans such as those developed by the FFO for Rattlesnake Canyon and Crow Mesa, and activity plans carried forward (listed in Appendix A).

Coordination and consultation took place during the public comment period on the Draft RMP/EIS, and will continue through this Proposed RMP/Final EIS, and the Record of Decision.

PUBLIC PARTICIPATION

The planning issues were developed partly by considering the concerns and comments from people outside the BLM and the cooperating agencies. Comments were received both in formal public scoping meetings and in public interviews conducted for the BLM in the local communities. The comments identified by FFO staff to be related to the RMP process are summarized in the following sections and were used to assist in the development of the alternatives analyzed in the RMP/EIS. The comments determined to be unrelated to the RMP process that could be addressed by FFO staff immediately were directed to the appropriate resource specialist for action.

Public Scoping

Formal public scoping meetings were held in the tri-cities area from September 26 to October 8, 2000. Comments were documented and later grouped into categories in a report created by the FFO (BLM 2001b). The three general categories of comments were: 1) OHV use and general recreational use of the FFO area, 2) commercial development within the FFO area, and 3) comments on the RMP process.

The first category comprised the most public comments at the meetings, with 439

respondents. Most of the comments can be subdivided into those people interested in opening the FFO area to increased OHV use and those who prefer to limit OHV access. Several areas and trails were specifically identified to be set aside for use only by non-motorized recreationists, such as hikers, bicyclists, or horses. Other areas and trails were recommended to be designated for or maintained as open to OHV use. Additional comments included recommendations to designate accessible shooting areas, to prohibit the use of firearms where public safety may be compromised, to develop environmental education areas, and to organize meetings with FFO staff to discuss the concerns of special user groups.

In the second category, comments from five respondents addressed the commercial use of public land and minerals, mostly related to the development of mineral leases including coal leases, the conflicts between coal mining and oil and gas development, concerns over the constraints on the development of oil and gas, and concerns over transferring federal surface ownership without protection of the development rights for mineral lessees (split estate). One comment recommended the development of commercial production of Navajo tea.

The last category contained comments submitted by one respondent and included recommendations for what should be included in the RMP revision. It was stressed that the RMP must comply with federal laws and should employ a collaborative process.

In addition to participating in the formal public scoping meetings, FFO staff specialists met with groups interested in recreation on public lands and received recommendations on trails that should be opened and developed for a variety of activities. While some of these recommended trails appear in the proposed alternatives, others will be reviewed by staff and possibly designated in the future through the development of activity plans, a process that provides opportunities for further public involvement.

Other FFO staff met with municipal officials to request that they identify parcels of land that the municipalities (county, city, school boards) might be interested in acquiring from the BLM through land transfers.

Public Interviews

Public interviews were conducted in the local communities from December 2000 to April 2001. Interviewers made a point of engaging a variety of people in conversation by frequenting community-gathering places, such as restaurants, laundromats, churches, and stores. The groups of people interviewed included residents, local government officials, local and out-of-town recreationists, oil and gas company employees, merchants, and others. In general, the interviews sought descriptions about settlement patterns, work routines, recreation activities, support services, geographic features of importance, changes on the land and in the communities, the use of public land, and ideas for improving BLM land management (Preister 2001).

Many of the comments from these interviews are important to the BLM but were determined by FFO staff to be unrelated to the development of the Draft RMP/EIS. The comments provided but not applied during development of the RMP will be considered by the BLM to help them serve the public, but were not documented in this Draft RMP/EIS or carried into the alternatives. The report that summarizes the interview methodology and lists all of the comments in detail is an unpublished document that can be obtained from the FFO (Preister 2001).

Many of the comments that were considered to be relevant to the development of the Draft RMP/EIS alternatives highlight the potential conflicts between the multiple uses of federal land. The major categories of these comments from the interviews can be grouped into the following categories: 1) oil and gas development, 2) recreation, and 3) community interests and urban development pressures.

Issues raised about oil and gas development include the following:

- Noise generated from oil and gas sites and its impact on recreational and residential land uses, the single most common complaint voiced in the interviews.
- Concerns over the high road density and its effects on watersheds, wildlife, and recreation.
- The use of roads developed by oil and gas companies for increased access by OHVs as a recreation issue, and damage caused to watersheds, wildlife, forestry, cultural and paleontological sites, and rangeland.
- Concerns over inadequate well and pipeline site reclamation causing the spread of weeds and excessive surface disturbance that affect watershed management, wildlife, and grazing land.
- Protection of cultural sites from pot-hunting and other surface disturbances once access is increased and the sites are identified for avoidance and protection.
- Concerns for watershed protection due to the lack of clean-up of spills in areas on or near well sites and the dumping of waste and household trash, partly because remote areas are opened to public access as more roads are constructed.
- Establishment of adequate fencing for livestock to prevent their access to well sites.

As in the public scoping meetings, recreation issues that were raised in the interviews documented the conflicts between different types of users, especially among OHV recreationists, non-motorized vehicle users, horseback riders, and hikers, and the need to designate specific areas for specified uses. Safety concerns were raised where firearms are used. Inadequate law enforcement was voiced as a concern because the BLM has had difficulty enforcing their limitations on use designations and compliance with existing laws

and policies under various programs due to the lack of sufficient resources.

Concerns over development pressures in the tri-cities area resulted in comments that BLM land should be made available for transfer for municipal uses, but the riparian habitat should be protected for its wildlife and recreation benefits.

Newsletter

A newsletter containing brief descriptions of some of the issues to be addressed in the RMP/EIS was prepared and mailed to almost 1,600 individuals, agencies, tribes, and organizations. It contained a coupon for interested people to request a copy of the Draft RMP/EIS or to ask to remain on the mailing list. Approximately 140 people returned coupons in response.

Public Review of the Draft RMP/EIS

Informal coordination with the public has taken place throughout the planning process through personal contacts, phone calls, and attendance at meetings.

Concurrent with the distribution of the Draft RMP/EIS, a BLM Notice of Availability was published in the *Federal Register* announcing the availability of the Draft RMP/EIS for public review and comment. The EPA Notice in the *Federal Register* marked the beginning of the 90-day review and comment period on June 28, 2002, which ended on September 26.

Four public hearings were held during the comment period from August 26 through August 29 in Farmington, Crownpoint, and Cuba, New Mexico and Durango, Colorado.

Written and oral comments received by the end of the 90-day period were reviewed, categorized, analyzed, and summarized. Responses to comments were addressed if they were substantive, related to inadequacies or inaccuracies in the analysis or methodologies used, identified new impacts or mitigation measures, or involved substantive disagreements on interpretations of significance (see 40 CFR 1502.19, 1503.3, 1503.4, 1506.6, and 516 DM 4.17). The summarized comments, names of people who submitted comments, and responses to the comments are included in Appendix P.

Many changes were made in this Proposed RMP/Final EIS as a result of comments submitted. After distribution of the Proposed RMP/Final EIS, a Governor's Consistency Review, and a 30-day public protest period, the BLM will issue a Record of Decision summarizing the findings and decisions regarding the selected alternative and its determination related to compliance with NEPA and other regulations. The RMP will then be prepared to document the resource management decisions and complete the BLM's resource management planning process.

Table 5-2 contains a partial list of federal, state, municipal, and tribal agencies, governments, and other interested organizations who received copies of the Draft RMP/EIS. Private citizens and businesses, including many in the oil and gas industry, also received copies. The Proposed RMP/Final EIS document will be sent to all those who submitted comments included in Appendix P, if their addresses are available. This document will also be obtainable from the FFO upon request, after the Notice of Availability has been published.

Table 5-2. List of Draft RMP/EIS Recipients

Federal Government	
U.S. Department of Agriculture	U.S. Department of Commerce
Carson National Forest	National Oceanic and Atmospheric Administration
Natural Resources Conservation Service	National Weather Service
Santa Fe National Forest	
U.S. Department of the Interior	Other
Bureau of Indian Affairs	Department of Defense
Bureau of Land Management	Department of Energy
Bureau of Reclamation	Environmental Protection Agency
National Park Service	Federal Energy Regulatory Commission
U.S. Fish and Wildlife Service	U.S. Army Corps of Engineers, Civil Works
U.S. Geological Survey	
State Government	
State of New Mexico	State of Colorado
Association of Conservation Districts	Division of Water Resources
Cuba Soil and Water Conservation District	Division of Wildlife
Department of Agriculture	State Parks
Department of Finance and Administration	Water Conservation
Department of Game and Fish	Wildlife Commission
Department of Energy, Minerals, and Natural Resources	Air Pollution Control Division
Environment Department	State of Utah
Highway and Transportation Department	Utah Department of Natural Resources
Interstate Stream Commission	Utah Division of Wildlife
Navajo Lake State Park	University of Utah
Oil and Gas Commission	State of Wyoming
Rio Arriba County Extension Service	Wyoming State Engineer
Sandoval County Extension Service	
State Engineer	
State Game Commission	
State Land Office	
State Parks	
State Police	
University of New Mexico	

Municipal Officials		
Archuleta County Commissioners		Farmington Public Library
City of Aztec		La Plata County
City of Bloomfield		McKinley County Commissioners
City of Durango		Rio Arriba County Commissioners
City of Farmington		San Juan County
City of Gallup		San Juan County Commissioners
Cuba Chamber of Commerce		San Juan Water Commission
Cuba Economic Development Board		Sandoval County Commissioners
Special Interest Groups		
Bloomfield Irrigation Ditch Association		Oil and Gas Accountability Project
Earthjustice		San Juan Citizens Alliance
Forest Guardians		San Juan College
Hammond Conservancy District		San Juan River Dineh Water Users
Independent Petroleum Association of Mountain States		Sangre de Cristo Audubon Society
Land and Water Fund of the Rockies		Sikes Citizens Review Committee
Lower Valley Water Users		Southwest Consolidated Sportsmen
Natural Resources Defense Council		Southwestern Water Conservation
Natural Resources Library		The Wilderness Society
Navajo Agricultural Products, Inc.		Upper Colorado River Commission
Navajo Dam Water Users		Western Land Exchange Project
NM Cattle Growers Association		Western Organization of Resource Councils
NM Farm and Livestock Bureau		Wildlife Management Institute
NM Oil and Gas Association		Wyoming Outdoor Council
NM Wilderness Alliance		
Tribal Governments and Organizations		
All Indian Pueblo Council	Pueblo of Nambe	Pueblo of Santo Domingo
Eight Northern Pueblos, Inc.	Pueblo of Picuris	Pueblo of Taos
Hopi Tribe	Pueblo of Pojoaque	Pueblo of Tesuque
Jicarilla Apache Tribe	Pueblo of San Felipe	Pueblo of Zia
Pueblo of Acoma	Pueblo of San Ildefonso	Southern Ute Indian Tribe
Pueblo of Cochiti	Pueblo of San Juan	The Navajo Nation
Pueblo of Isleta	Pueblo of Sandia	Ute Mountain Ute Tribe
Pueblo of Jemez	Pueblo of Santa Ana	
Pueblo of Laguna	Pueblo of Santa Clara	
Navajo Chapters		
Nageezi Chapter	Huerfano Chapter	Counselor Chapter

Table 5-3 and **Table 5-4** list the consultants and BLM staff that were directly involved with the preparation of the Draft

RMP/EIS. **Table 5-5** lists the BLM and other government staff who reviewed portions of this document.

Table 5-3. List of Preparers— Science Applications International Corporation

Name	Responsibility	Education	Experience
Neal Ackerly (Dos Rios Consultants, Inc.)	Cultural Resources	Ph.D., Anthropology, Arizona State University, Tempe M.A., Anthropology, University of Arizona, Tucson B.A., International Relations, Florida State University, Tallahassee	28 years, Vice President, Dos Rios Consultants, Inc., Senior Archaeologist
Kate Bartz	Water Resources	M.S., Landscape Architecture and Environmental Planning, Utah State University B.S., Environmental Studies, Utah State University	15 years, Environmental Specialist
Robin M. Brandin, A.I.C.P.	Program Manager, Quality Control	M.R.C.P., City and Regional Planning, Rutgers University B.A., History of Art, Bryn Mawr College	26 years, Senior Program Manager
Charles Burt	Biological Resources	M.S., Forest Zoology, SUNY B.S., Biology, Hope College	27 years, Senior Biologist
Bonnie Carson	Oil and Gas, Geology	M.S., Environmental Science and Engineering, Colorado School of Mines B.S., Geology and Geophysics, Missouri School of Mine B.S., Applied Mathematics and Computer Sciences, Washington University	14 years, Senior Project Engineer
Rob Cavallaro	Fisheries	B.S., Forestry and Wildlife, Virginia Polytechnic Institute and State University	12 years, Wildlife Ecologist

Name	Responsibility	Education	Experience
Jonathan Cohen	Document Production	B.A., Communication Arts, University of Wisconsin, Madison	7 years, Word Processor
Chris Crabtree	Air Quality	B.A., Environmental Studies, University of California, Santa Barbara	16 years, Senior Air Quality Meteorologist
David Dean	GIS, Biology	B.S., Biology, University of Wisconsin, La Crosse	2 years, Environmental Scientist
Ellen Dietrich	Project Manager, Soils, Rangeland, Noise, Coal	B.A., Anthropology, University of Illinois	26 years, Senior Environmental Analyst
Susan Goodan	Land Use, Recreation, Wilderness, Socioeconomics, Environmental Justice	M. Architecture, University of New Mexico B.A. Philosophy/ Archaeology, University of Cape Town, South Africa	14 years, Senior Environmental Planner
Heather Gordon	GIS	B.A., Environmental Studies and Planning, California State University, Sonoma B.A., Liberal Studies, California State University, Sonoma	5 years, GIS Specialist
Ken Heil	Vegetation, Weeds	M.S., Botany, Washington State University B.S., Biology, Fort Lewis College	18 years, Professor of Geology and Biology, San Juan College
Jon Marin	Coal	M.S., Geology, South Dakota School of Mines and Technology B.S., Earth Science, University of South Dakota	19 Years, Senior Geologist
Richard McEldowney	Biological Resources	M.S., Rangeland Ecosystem Science, Colorado State University, 1999 B.S., Wildlife Biology, University of Montana, 1993	6 Years, Wetlands Scientist

Table 5-4. List of Preparers— Bureau of Land Management

Name	Responsibility	Education	Experience
Elizabeth C. Allison	Technical Coordinator	B.S., New Mexico State University	BLM: 28 years, Planning and Environmental Coordinator/ Environmental Specialist
Charlie Beecham, P.E.	Solid Minerals (Coal)	B.S., Colorado School of Mines	BLM: 17 years, Mining Engineer Branch Chief, Solid Minerals Industry; 5 Years, Mining/Oil and Gas.
Kelly Castillo	Fire/Forestry	B.S., Northern Arizona University	BLM: 4 years, Fire Management USFS: 8 years, Fire Management
James M. Copeland	Cultural Resources	M.A., Colorado State University	BLM: 11 years, Lead Archaeologist Navajo Nation: 5.5 years, Archaeologist NPS: 2 years, Archaeologist BIA: 1.5 years, Archaeologist Private Contracting: 5 years
John Hansen	Wildlife Management	M.S., (in progress) Entomology, University of Nebraska B.S., Idaho State University	BLM: 24 years, Wildlife Biologist, Range Conservationist NRCS: 3.5 years, Soil/Range Conservationist Idaho Fish and Game: 2 years
Steve Henke	Field Office Manager, Initial Team Leader	B.S., New Mexico State University	BLM: 25 years, Field Office Manager, Supervisory Range Conservationist, Range Conservationist
Terry Johnson	Roads	A.A.S., Bemidji Technical College	BLM: 2 years, Civil Engineer Technician USFS: 25 years, Civil Engineer Technician
Jim Lovato	Oil and Gas	B.S., New Mexico Institute of Mining and Technology	BLM: 18 years, Petroleum Engineer MMS: 2 years, Petroleum Engineering Technician
Robert Moore	Land Use, Team Leader	B.S., Colorado State University	BLM: 31 years, Natural Resource Specialist

Name	Responsibility	Education	Experience
Jackie Neckels	Recreation/Wilderness	B.A., New Mexico State University	BLM: 12 years, Environmental Protection Specialist, Outdoor Recreation Planner
Bruce Prater	Noise Policy	B.S., University of Alabama	BLM: 5 years, Bureau Safety Manager Dept. of Army: 23 years, Safety Specialist
James Ramakka	RMP Project Manager	B.S., Cornell University M.S., University of Maine	BLM: 23 years, Planning Coordinator, Wildlife Biologist NPS: 1 year, Natural Resource Specialist USFS: 1 year, Wildlife Biologist
Ray Sanchez	Range Management	B.S., New Mexico State University	BLM: 20 years, Range Management USFS: 4 years, Range Management NRCS: 2 years, Range Management
Richard Simmons	Recreation/Wilderness	B.S., Utah State University	BLM: 8 years, Outdoor Recreation Planner NPS: 19 years, Resource Management, Visitor Protection/ Interpretation
Dave Simons	Cultural Resources	B.A., University of New Mexico	BLM: 17 years, Archaeologist
Bill Walsh	Bureau of Reclamation Representative	B.S., California State College	BOR: 25 years, Supervisory Resource Management Specialist, Geologist
Barney Wegener	Threatened and Endangered Species/ Riparian	B.S., Ft. Lewis College	BLM: 9 years, Natural Resource Specialist
Dale Wirth	Soil, Air, Water, Coal	B.S., Colorado State University	BLM: 13 years, Natural Resource Specialist BIA: 7 years, Soil Scientist OSM: 3 years, Project Manager
Support Staff			
Vera Bee	GIS		
Luanne Crow	Mailing		

Table 5-5. List of BLM Reviewers

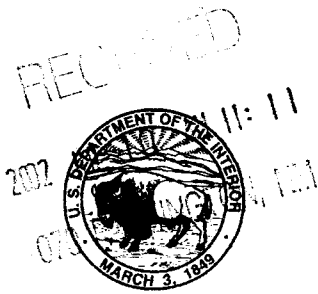
Farmington Field Office	Albuquerque Field Office	New Mexico State Office
Mary Jo Albin	John Bristol	Mark Blakeslee
Elizabeth C. Allison	Kent Hamilton	Bernard Chavez
Ilyse K. Auringer	Pat Hester	Stephen Fosberg
Charlie Beecham		Mark Hakkila
Kelly Castillo		Clarence Hougland
James M. Copeland		James Olsen
Joel Farrell		Joan Resnick
Peggy Gaudy		Paul Sawyer
John Hansen		John Selkirk
Steve Henke		James Silva
Shannon Hoefeler		Jay Spielman
Terry Johnson		Gary Stephens
Jim Lovato		Ida Viarreal
Dave Mankiewicz		John W. Whitney
Ralph Mason		
Robert Moore		
Jackie Neckels		
James Ramakka		
Ray Sanchez		
Rich Simmons		
Dave Simons		
Brian Watts		
Barney Wegener		
Dale Wirth		

AGENCY COMMENT LETTERS ON THE DRAFT RMP/EIS

On the following pages are copies of the original letters from state and federal agencies

and one tribal government that submitted comments on the Draft RMP/EIS during the public comment period.

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United States Department of the Interior

FARMINGTON INDIAN MINERALS OFFICE

1235 La Plata Highway Suite B
Farmington, New Mexico 87401-1805

IN REPLY REFER TO:
RMP/EIS

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

JUL - 9 2002

To: RMP Project Manager
Farmington Field Office

From: Director
Farmington Indian Minerals Office

Date: July 5, 2002

Subject: Draft Farmington Resource Management Plan and Environmental Impact Statement

After careful review of the Draft Farmington Resource Management Plan and Environmental Impact Statement (RMP/EIS) I have several concerns with land use activities near or on the Navajo allotted lands. My main concerns stem from the fact that the Navajo allotted lands are interspersed with the Federal, State, Tribal, and Fee lands in the San Juan Basin. Consequently, the outcome of this study will have an impact on the people living in the basin.

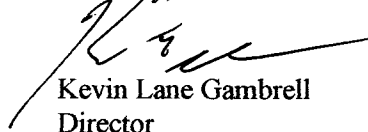
My first concern is the consultation with Huerfano Chapter, Nageezi Chapter and the Farmington Indian Minerals Office. In chapter 5 there is discussion as to who received copies of the draft RMP/EIS. The community chapters, which are centrally located in the reviewed areas as well as having the largest Navajo populations living in remote locations, never received a copy of the document. These chapters are very active in community planning and should be included in the distribution list. In addition, the Farmington Indian Minerals Office was not a recipient. This office is a multi-bureau office, works closely with the Navajo individuals living in the San Juan Basin, and is trustee for mineral development on the Navajo allotted lands that are interspersed with federal lands. As such, this office needs to know the land issues discussed in the draft RMP/EIS.

I have a concern with lack of analysis on the dangers of hydrogen sulfide, especially in areas that use water-flooding techniques. The Northern part of the San Juan Basins has high concentrations of hydrogen sulfide. This is major health concern and should be included in this report.

This report appears to overlooks the demographics of the San Juan Basin. The Native American population is one of the fastest growing populations in the country and the dominant culture in this part of New Mexico. As a result, new housing development and home site leases have significantly increased in remote areas of the San Juan Basin that are co-located in the oil and gas development zones. This document does not address land use impacts on these cultures.

Should you have any questions, please contact me at (505) 599-8961.

Sincerely,



Kevin Lane Gambrell
Director

CC: Wilson Ray, President Huerfano Chapter
Calvert Garcia, President Nageezi Chapter
Irvin Chavez, President, Shii Shi Keyah Allottee Association

NAME

FM

FM-L&R

R&R

EP

Arch

Lands

FM-mins

PMTN REPLY REFER TO: 1610 (07200)

Coal

I&E

FM-Admin

IRM

Ranger

Remarks



United States Department of the Interior

RECEIVED

BUREAU OF LAND MANAGEMENT

2002 AUG 26 PM 1:36

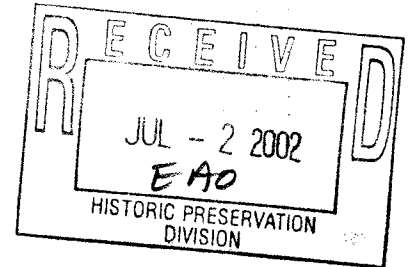
Farmington Field Office

1235 La Plata Highway, Suite A

Farmington, New Mexico 87401

070 FARMINGTON, NM

065278



Dear Reader:

Enclosed for your review and comment is the Draft Farmington Resource Management Plan (RMP) and Environmental Impact Statement (EIS). Your input is an important element in the effective management of the public land in northwestern New Mexico. We ask for your assistance and participation in evaluating these draft documents. Your review and comments are needed to ensure that your concerns have been considered in the planning process.

The Draft RMP/EIS outlines alternatives for managing all the uses of the public lands within the Farmington Field Office (FFO) boundaries. In addition, the management of the federal oil and gas resources within the New Mexico portion of the San Juan Basin are being considered.

There are four management alternatives described in this document, each with a different emphasis and each addressing the planning issues that were identified early in the planning process. The environmental consequences of implementing each of the alternatives have also been analyzed.

Your comments are invited on the alternatives and the adequacy of the impact analyses. Comments will be fully considered and evaluated in developing the Proposed RMP and final environmental impact analysis. Comments are most useful when they address one or more of the following:

- Errors in the analysis;
- New information that would have a bearing on the analysis;
- Misinformation that could affect the outcome of the analysis;
- Requests for clarification;
- Identification of a substantive new alternative that provides a different mix of allocations from any of the existing alternatives.

Where possible, refer to the pages and paragraphs on which you are commenting.

Comments on this document will be accepted during the 90-day comment period and must be postmarked no later than September 26, 2002. Public hearings and meetings will be held during the comment period to discuss the management alternatives, answer questions and to receive comments. All meeting notifications will be published on the FFO web site, www.nm.blm.gov, under "Field Offices, Farmington Field Office" (subject to internet availability), and in the Farmington Daily Times and the Albuquerque Journal newspapers. Please call 505-599-6307 for clarification of information on the hearings, meetings or comment period.

Comments on this document should be addressed to:

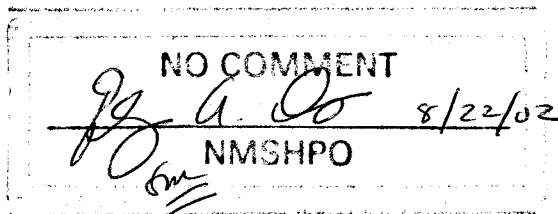
RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Comments will be fully evaluated and considered in preparation of the Proposed Resource Management Plan and Final Environmental Impact Statement (PRMP/FEIS). If changes are minor, the PRMP/FEIS will include only the changes and will not be a full reprint of the Draft RMP/EIS. For this reason, reviewers are asked to retain their copy of the Draft RMP/EIS for use in conjunction with the PRMP/FEIS.

Through your participation in this planning effort, we can move forward toward a common goal of improved public land management. We appreciate your interest in the multiple use management of BLM-administered lands.



for Steve Henke
Field Manager



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2002 AUG 23 AM 11:36
070 FARMINGTON, NM

SAN • JUAN • BASIN
HEALTH
DEPARTMENT

RMP Project Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

23 August, 2002

RE: Comments on Draft Farmington RMP and EIS

Dear Project Managers:

Please consider the following comments and items that I have addressed in response to your Public Comment Period. Thank you for your time and consideration.

- 1) The Alternatives B, C and D are strikingly similar. They appear to be a rather coarse, computer-generated approach that does not give adequate consideration towards alternatives 10% to 50% between Alternative A and D. These Alternatives should be re-evaluated.
- 2) The Alternatives do not consider the economic downfall that may occur to tourist-based economies confronted with air quality degradation. Cumulative environmental impacts need additional attention, as do cumulative economic impacts.
- 3) No mention is made of the possibility of future air quality enhancement, and the benefits that clean air generate—economically and environmentally. The RMP assumes that air quality will get worse, and that efforts should be evaluated to figure out how bad things might get.
- 4) The Alternatives barely recognize or acknowledge regional air pollution. The importance of collaborating with the Colorado Air Pollution Control Division, the Southern Ute Tribe, Colorado-based county health departments and regional government entities cannot be understated. Air quality management plans, pollution prevention strategies, monitoring programs and potential mitigation all deserve additional attention.
- 5) The net increase in air pollutant emissions from gas compressors of 99.7%, when compared to a 1% increase in jobs (in a neighboring tri-city area) appears to support environmental injustice.
- 6) The Environmental Justice criteria presented is woefully poor, and refuses to admit that the greatest proportion of air pollutants will affect citizens in the local and regional vicinity.
- 7) Respiratory health studies need to be undertaken as soon as possible. One must identify if existing oil and gas production has already resulted in elevated cases of respiratory distress. Additional development activities could then project adverse human health impacts.

- 8) The Planning Criteria were under-developed and short-sighted. The "5 Planning Issues" have exacerbated an approach that needs better direction. I suggest not focusing on several site-specific issues, but paying greater attention to regional resources, ecosystem management and best available technologies.
- 9) Chapt.2. The Continuing Management Guidance section pays inadequate attention to visual resource management. Nearby Class I and Class II areas will be impacted by the proposed development, unless better mitigation plans are drawn up.
- 10) This RMP needs to better address concerns over ambient air quality. The elevated levels of ground level ozone in the Bloomfield area need to be confronted, not circumvented.
- 11) The RMP should strongly encourage the classification of presently unclassified areas for air quality, and improve the monitoring and evaluation of areas for NOX, SOX, Particulates and Ozone.
- 12) The RMP should research existing meteorologic stations for scientific information. Comments on "generally,.." or "rarely,.." is not good science. Voids in data need to be addressed by a request for additional air monitoring. Temperature, inversions, wind speed, wind direction, and other met data is extremely important with regards to regional air quality.
- 13) Chapt. 3. The Affected Environment section ignores the current condition of local and regional air quality resources. The statement regarding "Region of influence" (ROI) is very misleading. In many circumstances, ROI is not limited to "a few miles downwind". Better science is needed in this area.
- 14) PM 2.5 needs additional attention. Limiting 2.5 conversation to a historical court decision is a strange way to address the importance of fine particulate matter.
- 15) Table 3-14 shows Max Pollutant concentrations by year—this data needs to be accompanied by an additional table showing Average concentrations, by month and by year. This will enable us to scrutinize levels, determine trends and focus on incremental levels of air pollutants.
- 16) The RMP needs to mention the contribution of the proposed development to CO2 levels and greenhouse gas concerns. A few gas companies have gone to great lengths to reduce greenhouse gases. They and their technology should be promoted.
- 17) Stronger language is needed regarding Class I air resources. The RMP's concern for protecting vistas from outside influences should be translated into a decisive action plan to prohibit activity that would cause Class I air degradation. BLM's efforts should also be directed towards improving already-impacted vistas in Class I and Class II areas.
- 18) Under the Demographics section in Chapt. 3, public health was neglected from discussion. As a major employer in the area, I suggest that San Juan Regional Medical Center be contacted to assist with the provision of pertinent health status information such as asthma, emphysema, CPD and other respiratory illnesses.
- 19) Under Environmental Justice in Chapt. 3, I believe that the RMP lacks understanding of what environmental justice is. Expertise in this area should discuss disproportionate health risks.
- 20) Under Environmental Consequences in Chapt.4, the RMP dismisses the importance of air quality impacts and concentrates on surface disturbance. This may be due to the BLM's area of expertise. Air quality is of greater regional importance.

- 21) As previously stated, the 5 issue areas chosen by the RMP are inadequate to address the seriousness of the air quality concerns.
- 22) Table 4-17 needs better explanation. The comments decline to comment on human health impacts of increased air pollution. The RMP assumes that a 5-fold increase in air pollutants is an acceptable health risk to local populations. The USFS may disagree, and may mention scenic quality-of-life values as well. The State of New Mexico Health Department can assist the RMP in educating the public about additional health risks for additional pollutant levels below the EPA exceedance levels.
- 23) Under Incremental Risks from Hazardous Air Pollutants in Chapt. 4, key health concerns are raised, and this is appreciated. These concerns should be expanded upon for NOX, PM 10 & 2.5, and Ozone.
- 24) Page 4-61: "PSD" raises concerns over pollution loopholes. The RMP should get assistance in addressing these loopholes.
- 25) Page 4-64: "The potential exists for gas production emissions under Alternative B to significantly impact visibility in the Mesa Verde National Park". All "Potential" for significant impact should be further evaluated and mitigated prior to "potential" approval.
- 26) Page 4-64: The RMP conclusion should state that minor emissions sources result in major air pollutant emissions. Rather than mentioning "potential possibilities", the RMP should state that, based on these studies, significant cumulative impacts to visibility resources in the Mesa Verde and San Pedro Parks Class I areas will occur.
- 27) Page 4-65: The suggestion that NOX emissions levels for each compressor not exceed 10 gm/hp/hr. is beneficial. Much greater efforts can be made in the pollution prevention arena. (Note that BP is the largest U.S. producer of solar technology.). Best available technologies should be required in the field.
- 28) Page 5-7: Under Table 5.2, List of Draft Recipients, why wasn't the Colorado Air Pollution Control Division included?

End of initial comments on the Farmington RMP.

As I will be unable to attend the August meeting in Durango, please add me to your mailing list for future drafts and updates. Thank you.

Wano Urbonas, Environmental Health Director
San Juan Basin Health Dept.
Box 140
Durango, CO 81302





United States Department of the Interior

NATIONAL PARK SERVICE

INTERMOUNTAIN REGION
Intermountain Support Office - Denver
12795 West Alameda Parkway
Post Office Box 25287
Denver, Colorado 80225-0287

IN REPLY REFER TO

September 16, 2002

RMP Project Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Ste A
Farmington, NM 87401-8754

RE Comments on Farmington Resource Management Plan/Environmental Impact Statement (RMP/EIS)

Dear RMP Project Manager

Thank you for the opportunity to review the Farmington Resource Management Plan/Environmental Impact Statement. The following comments were drafted based on review of the Draft RMP/EIS, the accompanying Air Quality Modeling Analysis Technical Report, and attendance at the public meeting for this plan in Durango on August 29th. These comments have been compiled from those of two National Park Service units including Chaco Culture National Historic Park and Mesa Verde National Park. You will see below that comments from these two units have been left separate (and may overlap to some degree), so as to accurately and adequately relay their concerns.

COMMENTS FROM CHACO CULTURE NATIONAL HISTORIC PARK

General Comments:

- 1 The National Park Service does not appear to have been included in initial public scoping and would like to participate in future scoping and planning efforts in the BLM Farmington Field Office area (Chaco Culture NHP is 34,000+ acres in the center of the planning area)
- 2 The overall format and verbiage of the document is difficult to read. The layperson will likely have difficulties understanding the document and distinguishing between the four given action alternatives and the associated impacts.
- 3 Within the impacts summary, each alternative appears at a glance to be nearly identical, and perhaps not sufficiently discrete. A more detailed description explaining why the alternatives are carried forward should be included.
- 4 The "conservation alternative" title seems misleading as if impacts will be restricted and the act of conservation of resources will be implemented. After reading the alternatives, the current management or no action alternative has the least impacts to resources (current actions) rather than

the "conservation alternative " Perhaps Alternative C should be re-titled to more accurately describe the action proposed

- 5 Page 4-48 The Socioeconomic impact analysis appears to be missing some information We recommend that the following be analyzed for each alternative

-Estimated time periods of viable oil and gas extraction (How long will it take to deplete resources under each alternative?—this analysis is essential when discussing the most environmentally friendly alternative for this EIS)

-Industry growth and revenue increases

-Property values and costs and expected increases or decreases

-Health care costs expected increases or decreases

-Analysis of costs of breaching industry contracts versus maintaining industry contacts should be included

- 6 The cumulative impacts analysis should be more thorough We recommend including a broader temporal scope of projects (perhaps BLM and other projects within the past 20-30 years), and maps where possible to illustrate monitored impacts over time in comparison with current activities and project activities by alternative

Air Quality

- 7 Air quality information appears to be insufficient with regards to sampling/monitoring Air quality (AQ) modeling was not completed on a cross boundary (state, federal, reservation, etc) macro-scale No specific sites/ locations were identified as places where AQ data will be collected Chaco Culture NHP is willing to assist with quantitative AQ monitoring before during and after the implementation of the 2002 EIS
- 8 No specific sources of air pollution were mentioned or located, therefore as a result, the process of mitigating potential impacts will be increasingly difficult to isolate once the FFO EIS implementation begins What are the rates of transient sources? What are local sources? How much have they decreased or increased during and after implementation of the EIS? What mitigation will be implemented if needed?
- 9 The cultural landscape of the designated Wilderness areas, NPS lands, and "cultural areas" were not described or analyzed for potential impacts under each alternative in the EIS, nor was it described on page 3-60 under "visual resources "
- 10 12,500 additional well pads can affect the night sky as a resource The night sky as a viewshed was not described or analyzed within the EIS under page 3-60 the description of visual resources The Mesa Verde viewshed (Class I viewshed) was not discussed or considered -- presumably because its location is outside the FFO area -- however, the analysis should include potential impacts across this arbitrary line
- 11 Should AQ decrease or increase, AQ monitoring will be continued, but no mitigation is identified or discussed within the FFO EIS

Map Comments:

- 12 The National Forest boundaries, Wilderness Areas, and Reservation boundaries are present, however, Chaco culture NHP is not delineated on maps 2-1 through 2-11 (within the back pockets of the EIS), or in some maps within the certain chapters of the EIS EX map on page 3-36 delineates tribal and reclamation lands, but no NPS lands
- 13 Highway 57 is no longer a “through access” highway across NPS/Chaco Culture NHP lands and needs to be updated/deleted as shown from all of the maps within the EIS
- 14 County roads are inconsistently labeled and shown on the maps For example, see 3-59 vs 2-228 map
- 15 A map showing all well locations over time (50 years) should be included to discuss and illustrate the cumulative impacts over time

Additional Comments:

- 16 The document contains little or no analysis of HAZMAT planning for spill prevention or Action Plans for accidental spills should oil and Gas extraction operations go awry We recommend including this information in the EIS
- 17 The EIS states that 1800 archaeological sites will be mitigated or avoided under the preferred alternative, however there is little discussion on what “mitigation” entails There is no analysis or discussion of ethnographic resources including compliance with NAGPRA (Native American Graves Patiation and Repatriation Act) issues If 1600 archaeological sites are mitigated / or excavated and destroyed, then what are the precautions for inadvertent discovery archaeological sites or of human remains under NAGPRA? How will the BLM enforce NAGPRA law on industry development on public lands?
- 18 Since there has been renewed interest in coal mining around the perimeter of Chaco Culture NHP, the National Park Service and Park staff would like to participate in the planning for the Coal Leasing Suitability Assessment as described on 4-86 The boundary of Chaco Culture National Historical Park is not shown in proximity to the discussed leased coal belts (PRLA tracts or the Coal Belt SMA on map 2-4), however, we recommend showing Chaco Culture NHP with it's 3 outlying units on all associated maps (not only Map 4-1 on page 4-25) including labels for Penasco Blanco, Kin Ya'a, and Pueblo Pintado on these maps
- 19 On page 3-15 McKinley County has soil maps available at a resolution of 1 24,000 Chaco Culture NHP has a soil map nearing completion at a resolution of 1 12,000 We are happy to share information as it relates to your project, so that the most up-to-date data can be used for the impact analysis

COMMENTS FROM MESA VERDE NATIONAL PARK

General Comments:

1. The National Park Service (NPS) believes that the BLM should have made direct contact with Mesa Verde National Park at the start of this plan's external scoping process. The BLM initiated planning on the Draft RMP/EIS without NPS input regarding air quality concerns over the park's Class I status and how the plan could adversely affect the mission of the NPS and that of Mesa Verde (see also comment #1 from Chaco Culture NHP).
2. On August 29, 2002, National Park Service staff attended a public meeting (workshop followed by the open hearing) in Durango to learn more about the proposals and impacts from the BLM representatives and from participating citizens. The BLM did a nice job with this combination of public participation forums. The concerns of the public should be addressed in the RMP/EIS including more discrete alternatives; inclusion of a 'low impact' alternative; impacts related to wildfires; adequate cumulative analyses that covers all four states; hazardous material spills; sufficient wildlife analyses; improved public involvement program; impacts to watersheds from increased air pollution; depletion of groundwater; quality of life for citizens (social impacts); public health (cancer) including impacts to children from air pollution; impacts to the National Park Service (particularly Mesa Verde) and tourism; mitigation (destruction?) of archaeological sites; the gas/oil company's responsibility for impacts to the environment and people's health and how BLM will ensure mitigation is carried out; degradation of forage for livestock; and alternative energy sources and conservation (solar power).

Air Quality:

3. The NPS is most concerned about how the proposed expansion of natural gas production would harm the park's air quality. Although only qualitative, the description of air quality impacts to Mesa Verde in the Draft RMP/EIS is alarming to the NPS. Unless these impacts are prevented and mitigated, these impacts probably would prevent the park from achieving progress under the Regional Haze Rule and Congressional Federal Register 209. The Draft RMP/EIS has a range of action alternatives that are virtually identical in terms of the emission of air pollutants from gas production. The NPS believes there should be a serious alternative developed for the Final RMP/EIS that would result in far less new air quality degradation or no new increase at all.
4. Mesa Verde National Park already has two decades of air quality monitoring data. The NPS believes that this and other regional data needs to be used in developing a "far-field" model to quantitatively determine regional and cumulative impacts to the park's Class I airshed. In developing this model, the NPS would like to see the BLM inventory the regional sources of air pollution including existing point sources, proposed new point sources, other existing and predicted sources, and develop and utilize a growth formula for the region. The NPS Air Resources Division should review and comment on the protocols for the "near-field" model and for a "far-field" model. The NPS needs to know what the model would predict for impacts to Mesa Verde such as the average number of miles of visibility reduced during each season and the increased levels of individual pollutants including nitrous oxides, ozone, sulfur dioxide, and particulates.
5. Currently, the BLM suggests that future monitoring by the New Mexico Air Quality Bureau would determine if air pollution impacts were harming Mesa Verde as the new wells and compressors went on line, thus triggering the need to find ways to reduce pollutants after the air quality has been degraded. The NPS believes that the scale of the proposed increase in gas production alone indicates that the BLM does not need to wait for the results from monitoring. Minimizations and mitigations need to be built in up front. The key concept is to prevent air quality degradation to a Class I area.

6. The NPS believes that the scale and scope of this plan also requires the need for an enhanced regional air quality monitoring program with more stations and all data analyzed in a coordinated manner. Project revenues could cover the costs.
7. The NPS is interested in knowing if the gas production described in the Draft RMP/EIS would be covered under the "New Source Review" pollution credit plan and, if so, how the pollution credits would be used and analyzed for the gas production program and how this would be covered under NEPA.

Visual Resources:

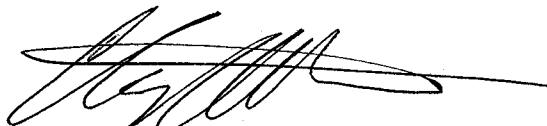
8. The NPS believes that the Final RMP/EIS needs to address night lighting impacts on visual resources. The NPS is concerned that the natural dark night sky at Far View in Mesa Verde National Park would be degraded from the implementation of the proposed action. The final plan needs to describe how light pollution would be mitigated by such means as light shielding, directional lighting, and the use of less intense lighting and/or more subdued light colors.

Wildlife:

9. The NPS would like to see the impacts from the proposed actions reduced to far ranging mammals and migratory birds, ecosystem resources that are shared with Mesa Verde National Park. Habitat damage needs to be kept to a minimum during construction and production and, just as important, post-construction landscape rehabilitation, weed control, and revegetation with native species of disturbed areas needs to be pursued until fully successful. Use of project revenues should be able to ensure good quality efforts and results. Please also include information pertaining to compliance with the Migratory Bird Treaty Act.

Again, we appreciate the opportunity to comment on the Draft RMP/EIS, and to share with you our initial thoughts and concerns on the project. Because of the controversial nature of this project, and the potential impacts to National Park Service resources, we hope to become more involved throughout the remainder of the project. If you have any questions regarding these comments, please feel free to contact me to discuss in more detail.

Sincerely,



Cheryl Eckhardt
NEPA/106 Specialist

cc: Chaco Culture National Historic Park
Mesa Verde National Park
Regional Files

From: Bill Walsh
To: jim_Ramakka@nm.blm.gov
Date: 9/24/02 9:28AM
Subject: Farmington BLM June 2002 Draft RMP/EIS, Reclamation review comments

RECEIVED

2002 SEP 25 AM 11: 23

070 FARMINGTON, NM

To: Jim Ramakka
RMP Project Manager
BLM Farmington Field Office

From: Bill Walsh
Southern Land and Recreation Management Team Leader
Western Colorado Area Office, Durango

Subject: Farmington BLM June 2002 Draft RMP/EIS, Reclamation review comments, Navajo Unit, CRSP.

Thank you for allowing us the opportunity to review the subject document. The attached comments are a result of a review and discussions among our Land Management and Environmental staff, and Navajo Lake New Mexico State Park staff.

Please contact me at (970) 385-6554 or bwalsh@uc.usbr.gov with any questions concerning comments.

CC: dbryant@state.nm.us; Francis, Michael; Ozga, Kathleen; Waldman, Rob

Farmington Resource Management Plan
And
Environmental Impact Statement
June 2002 Draft
Bureau of Reclamation Review comments
Bill Walsh
9/23/02

Pg. 1-2, 2nd column, 1st paragraph, (2), change to read, "Upper Colorado Region, Western Colorado Area Office, Durango Colorado."

Page 1-5, tables 1-1 and 1-2. Reclamation total surface acres = 31,035. Reclamation total surface acres overlying federal minerals = 15,875. Meaning 49% of Reclamation land is over private/state mineral estate that is not controlled by BLM. This DEIS, by not clearly pointing out this situation, gives the general impression to the public that it describes the total oil and gas development projected to take place on Reclamation land. Decision makers using this EIS for input should be aware that the impacts identified in this document may represent only 50% of the total impact of oil and gas development on Reclamation land.

Pg. 2-30, 1st column, last paragraph, "Oil and gas development on the land around Navajo Reservoir..." This statement is used in each alternative description and we assume it refers to lands under Reclamation jurisdiction.

Pg. 2-236, 1st column, 1st complete bullet, "closed loop mud systems" are mentioned as mitigation to minimize surface disturbance and intrusion into undisturbed areas. These systems would be most applicable in the vicinity of surface waters such as Navajo Reservoir and could add protection against spills resulting from reserve pit leaks. Closed loop mud systems should be listed under New Technology on page 2-235 due to industry comments on the unavailability of these systems in the San Juan Basin.

Page 2-237, 1st column, last paragraph. Increasing the VRM classification for Reclamation lands from IV to II seems warranted to protect the view shed around the reservoir.

Page 2-237, 1st column, last paragraph. Reclamation supports the timing limitation but needs the flexibility to allow variances to it.

Page 3-24, 1st column, last paragraph. "This section discusses.....and waters of the United States." The expectation is a discussion specific to the Clean Water Act, but there is no other reference to waters of the United States in the section.

Page 3-54, 2nd column, last paragraph. USBR administers a total of 38,324 acres in both states, rather than the 31,025 acres stated. Decision makers should keep in mind that 40% of Reclamation administered land at Navajo Reservoir is below the high water line.

Increases in surface disturbance from oil and gas development will be concentrated on the remaining 60%.

Page 4-105, 2nd column, first full paragraph. Stronger evidence or cited research is needed to support the biological justification for making the assumption that habitat fragmentation thresholds will not be passed.

Page 4-106, 2nd column, under Oil and Gas Leasing and Development. "Implementation of the conservation alternative..." This is the lead in statement for discussions of impacts for Alternative D. This is an example of the editorial confusion sometimes found in the document.

Page E-1, paragraph IV, 1st sentence. Refers to Appendix B which is not included.

Page E-2, 2nd paragraph. 1st sentence. Refers to Appendix A which is not included. Reclamation will assume there is an asterisk next to our NSA designation in Appendix A to have prior approval status.

Page E-5, paragraph IV, 1st sentence. Refers to Appendix B which is not included.

Page E-6, paragraph V. States Reclamation land will be receptor focused while on page 2-236 Reclamation is listed as boundary focused for alternative D. Reclamation wishes to be receptor focused and requires prior approval to placing compressors.

Page E-7, paragraph VI, 3rd sentence. Refers to Appendix A which is not included. Reclamation will assume there is an asterisk next to our NSA designation in Appendix A.

Page E-7, paragraph V (which follows paragraph VI?), 4th sentence should read "Prior approval is required before setting a noise source that could effect the threatened or endanger, raptor, **or other NSA indicated with an asterisk** in Appendix A.

Mayor
Gail A. Aspromonte

Mayor Pro-Tem
Mike Arnold



City Commissioners
RECEIVED
Jerry Hanhardt
James J. Rubow
Larry Marcum

2002 SEP 26 PM 4:18

070 FARMINGTON, NM

RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

RE: Letter of Support to BLM for Inclusion of Alien Run and Aztec Trails into RMP Final Draft

To Whom It May Concern:

The Friends of the Aztec Library has been working with the Bureau of Land Management (BLM) to adopt into their Resource Management Plan (RMP), a mountain bike trail system located near the City of Aztec. This trail system includes the *Alien Run Mountain Bike Trail*, which is located in Hart Canyon and *Aztec Trails*, which starts at the corner of Main & Blanco and meanders out to Hart Canyon. Another trail under construction and will become known as *Area 51*, takes the rider further into Hart Canyon and will be rated as "extreme". The three trails connect in Hart Canyon, making a trail system that is contiguous with the City of Aztec and covering close to 40 miles of trails.

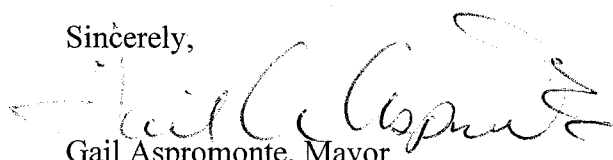
The Aztec City Commission voted unanimously on Sept. 11, 2002, in City Commission Meeting, in support of the BLM adopting these trails into the RMP Final Draft, and recognize that this inclusion would in effect "put us on the BLM map" and create a mountain bike trail system that could be utilized by all levels of mountain bikers, including beginning, intermediate, and advanced and have great potential for economic development for the City.

There are four alternatives outlined in the RMP Draft located on pages 159-161, under the heading of Alien Run. The Aztec Commission supports Alternative C, which gives us the maximum right-of-way on the trail system and this is the FOL's preferred choice as well.

Also *Aztec Trails*, which makes the trail system contiguous with the city limits, was not included in the RMP Draft even though it has been mapped, GPS'ed and the Archaeological Studies have been done and we would like it included in the RMP Final Draft as well.

Thank you for your consideration in this matter.

Sincerely,


Gail Aspromonte, Mayor
City of Aztec



SOUTHERN UTE INDIAN TRIBE

VIA HAND DELIVERY

September 30, 2002

Mr. Steve Henke
Field Office Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

RECEIVED
2002 SEP 30 PM 4:35
070 FARMINGTON, NM

RE: Comments on the Farmington Resource Management Plan (RMP) and Environmental Impact Statement (EIS)

Dear Mr. Henke:

Thank you for allowing the Southern Ute Indian Tribe ("Environmental Programs Division") to comment on the draft RMP and EIS for management of public lands and resources under jurisdiction of the Farmington Field Office. The Southern Ute Indian Tribe offers the following comments for your consideration.

Comments Regarding Specific AIR Issues

Page 3-48

In general, information regarding the National Ambient Air Quality Standards (NAAQS) is well described. Despite standards for both fine particles (PM_{2.5}) and ozone (8-Hr.) being recently promulgated (1997) by the United States Environmental Protection Agency, description and analysis of both pollutants is recommended for inclusion in the final EIS. This will allow for a more comprehensive study of air pollution within the project area.

Table 3-14, Page 3-50

Pollutant concentrations for ozone (1998/2000) collected at the Shiprock substation exceed the 1-hr. (NAAQS) standard of 120 ppb. Data represented in Table 3-14 contradicts statements (pg. 3-50, Column 2) made to the effect that "pollutant levels within the project region have not exceeded any ambient air quality standard during the 1994 through 2000 monitoring period." We recommend that either the table or the statement be modified for consistency and accuracy.

Page 4-61, PSD

Based on modeling analysis (under Alternative B) Nitrogen Dioxide impacts consumed and surpassed the allowable annual PSD Class II increments ($33 > 25 \mu\text{g}/\text{m}^3$).

The Environmental Programs Division recognizes the complexity in preparing an EIS that would describe the project's potential impacts before the exact number of operational wells and their exact locations are known. Upon review of the conservative analysis used in the impact analysis, we concur that actual impacts during the time of development are most likely to be less than modeled. However due to the significance of NO₂ impacts, under Alternative B, at 2.0 g/hp-hr; we recommend serious consideration of utilizing well compressor units that have a lower emission factor rating of 1.0 or 1.5 g/hp-hr. Despite minor sources (wellhead compressors) not being regulated for PSD purposes they are still considered during a PSD review if they should fall within the impact area and are operating after the minor source baseline date has been triggered.

Comments Regarding General AIR Issues

NAAQS

The Southern Ute Indian Tribe has been monitoring air pollutants for the past twenty years. Although we have not exceeded the National Ambient Air Quality Standard for ozone we are currently studying the "somewhat" elevated levels of ozone in this area. As you may be aware ozone is a complex pollutant, formed chemically in the atmosphere due to pollution sources of nitrogen oxides and volatile organic compounds. Ozone is also known for its long-range transport characteristics. Ambient ozone levels should be considered due to the project area being within close proximity to major emitters of nitrogen oxides and volatile organic compounds.

Additionally, due to the magnitude of the project we recommend additional monitoring for the project area. It is highly recommended that monitoring include sensors for ozone and nitrogen dioxide, including operation of a PSD-quality meteorological tower.

Air Quality Modeling

Due to the possible magnitude of air quality emissions, but also due to the fact that the project area encompasses terrain features of long valleys and high hills it is highly recommended that terrain features be part of the near-field modeling analysis for the project area. Utilization of a flat-terrain grid system for this particular project area may misrepresent modeled emission concentrations.

Mitigation Measures

The mitigation measures listed on page 4-64 regarding gas well development are encouraging, but implementation and compliance issues for each of the mitigation measures should seriously be considered as part of the study. Despite surface area disturbance being insignificant and temporary for emissions of particulate matter, it is usually a public nuisance issue (i.e. visibility,

Southern Ute Tribe Comments - Farmington Resource Management Plan (RMP) and
Environmental Impact Statement (EIS)
September 30, 2002
Page 3

noise). Mitigation efforts should also involve odor suppression activities throughout all project development and operation phases.

If you have any questions regarding the comments provided, please call Virgil Frazier (Air Quality Program Manager) or myself at (970) 563-0135.

Respectfully submitted,

A handwritten signature in black ink that reads "Fran King Brown". The signature is written in a cursive, flowing style.

Fran King Brown
Division Head - Environmental Programs Division
Southern Ute Indian Tribe

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Acting Executive Director

2002 OCT -1 AM 10:12

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

Laboratory and Radiation Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

070 FARMINGTON, NM



Colorado Department
of Public Health
and Environment

<http://www.cdphe.state.co.us>

September 26, 2002

RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Re: "Farmington Resource Management Plan and Environmental Impact Statement (DRAFT), U.S. Department of Interior, Bureau of Land Management, June 2002."

"Air Quality Modeling Analysis Technical Report – Revision to the BLM Farmington Resource Management Plan and Amendment of the Rio Puerco Resource Management Plan," Prepared by Science Applications International Corporation, Prepared for Bureau of Land Management, Farmington, NM, May 2002

Dear Sir/Madam:

The technical modeling approach has not been reviewed in detail since the impacts from the emission sources discussed in the EIS primarily affect New Mexico. Thus, the focus of these comments is on ozone precursors that could realistically impact Colorado. The Division defers to the expertise of the New Mexico Air Quality Bureau for comments on the near-field air quality modeling.

The primary concern with the proposed development is the large projected increase in the emissions of nitrogen oxides (NOx). The DEIS states that the majority of the emissions increase will be from wellhead compression. For example, Table 4-15 on page 4-58 states that in project year 20, wellhead compression emissions will be about 68,000 tons per year, even though the text states that "the net change in annual emissions from current levels would be offset somewhat due to the abandonment of existing production." Since the magnitude of the offset is not quantified, the affect of the abandonment is unclear. Thus, the comments in this memo are based on the assumption that the emission reductions in year 20 from "abandonment" would not be large with respect to the overall emission estimate. Various mechanisms for improving emissions controls on wellhead compression engines should be investigated.

One of the primary concerns is that the increase in NO_x emissions will increase regional ozone levels in some locations. Table 3-13 on page 3-49 of the draft RMP/EIS does not include the 8-hour ozone National Ambient Air Quality Standard. A review of ozone observations at several western sites suggests that the federal 8-hour ozone standard may be threatened in some areas.

It is strongly recommended that additional ozone, NO_x, and meteorological monitoring stations be installed and operated in SW Colorado to improve our understanding of ozone levels in the Four Corners area. At a minimum, a permanent monitoring site near Durango is recommended.

We appreciate this opportunity to comment on the DEIS. If you have any questions regarding these comments, please feel free to contact me directly.

Regards,

A handwritten signature in black ink, appearing to be 'Mark McMillan', written over a circular stamp or seal.

Mark McMillan
Air Quality Planner
Colorado Air Pollution Control Division



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

RECEIVED

SEP 25 2002

2002 OCT -1 AM 10:24

Mr. Steve Henke
Field Office Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

070 FARMINGTON, NM

Dear Mr. Henke:

In accordance with the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, Environmental Protection Agency (EPA) Region 6 has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed revisions to the management plan for Federal lands in San Juan, McKinley, Rio Arriba, and Sandoval counties, New Mexico.

EPA rates the DEIS as "EC-2," i.e., EPA has "**Environmental Concerns and Requests Additional Information in the Final EIS (FEIS).**" EPA has identified environmental concerns and informational needs to be included in the FEIS to complement and to more fully insure compliance with the requirements of NEPA and the CEQ regulations. Areas requiring additional information or clarification include: project purpose and need, mitigation, alternative selection, and air quality.

Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act to inform the public of our views on proposed Federal actions. Detailed comments are enclosed with this letter, which more clearly identify our concerns and the informational needs requested for incorporation into the FEIS. As we agreed, additional comments are being developed by our Regional air program staff on project related air quality issues and will be provided soon and must be responded to and incorporated into the FEIS. If you have any questions, please contact Mike Jansky of my staff at 214-665-7451 for assistance.

EPA appreciates the opportunity to review the DEIS. Please send our office five copies of the FEIS when it is sent to the Office of Federal Activities, EPA (Mail Code 2252A), Ariel Rios Building, 1200 Pennsylvania Ave, N.W., Washington, D.C. 20460.

Sincerely yours,

Robert D. Lawrence, Chief
Office of Planning and
Coordination (6EN-XP)

Enclosure

**DETAILED COMMENTS
ON THE
BUREAU OF LAND MANAGEMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FARMINGTON FIELD OFFICE RESOURCE MANAGEMENT PLAN**

Background

The Farmington Field Office (FFO) of the Department of the Interior's Bureau of Land Management (BLM) and cooperating federal agencies are proposing to identify the projected development of federal oil and gas reserves and public lands administration and management over the next 20 years within the San Juan Basin of New Mexico. The planning area encompasses approximately 8,274,100 acres in northwestern New Mexico, and includes a mix of federal, state and private land ownership. The planning area includes all of San Juan County, most of McKinley County, western Rio Arriba County, and northwestern Sandoval County.

A Draft Resource Management Plan (RMP) Revision and a Draft Environmental Impact Statement (DEIS), which fulfill the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA) requirements for comprehensive land use planning for public lands, has been prepared to analyze the proposed changes in the management of federal lands under the jurisdiction of the FFO.

The Draft RMP/DEIS establishes and analyzes areas for limited, restricted or exclusive uses; levels of production; allowable resource uses; resource condition objectives; program constraints; and general management direction. The Draft RMP/DEIS has been developed using the principles of multiple use and sustained yield.

The land use planning and management direction addressed in the Draft RMP/DEIS pertains to public federal lands and federal mineral rights within the FFO boundaries. The Draft RMP/DEIS addresses the impacts of federal oil and gas leasing and development regardless of the surface ownership (i.e., state, tribal and private). When approved, the RMP will replace the existing land use management plan currently used to guide resource decisions in the FFO planning area.

Alternatives

The four alternatives considered in detail are:

Alternative A - Current Management (No Action Alternative): The Draft RMP/DEIS states that, under this alternative, the FFO would continue to manage oil and gas leasing and other resource responsibilities as it does currently. This alternative describes what environmental effects could result if none of the specific management activities proposed in the Draft RMP/DEIS would occur, although other environmental analysis of all or parts of the same area could occur.

Management guidance, implementation procedures, and special management designations would remain as they currently exist under the 1998 RMP, the 1991 Amendment for oil and gas leasing and development, the 1995 RMP Amendment for OHV use, the 1995 RMP Amendment for OHV use in the Glade Run Trail System, the 1998 RMP Amendment addressing coal leasing, the 1998 Amendment for cultural resources, the 2000 Final EIS for Riparian and Aquatic Habitat Management in the FFO, and the 2000 RMP Amendment providing standards for public land health and guidelines for livestock grazing. This alternative is considered to provide a baseline comparison of predicted environmental consequences associated with taking no action versus implementing any of the action alternatives.

Alternative B - Resource Production Focus: The Draft RMP/DEIS states that under this alternative, the Farmington RMP would be amended to allow for maximum oil and gas development in the planning area and maximization of other public uses of FFO land. Access and land limitations would be minimized, consistent with the Continuing Management Guidance. In the event of land use conflicts, priority would be given to minerals recovery.

Alternative C - Resource Conservation Focus: This alternative emphasizes conservation, protection, and enhancement of natural and cultural resources through management measures that provide limitations on surface disturbing activities. Additional areas would be delineated for special management designation.

Alternative D - Balanced Approach (Preferred Alternative): This alternative includes aspects of the other two alternatives, as well as the status quo, with the goal of balancing extraction of the mineral resource, multiple uses of public lands, and protection of natural and cultural resources. The goal of this alternative is to have full field subsurface development, as described in the Reasonable Foreseeable Development Scenario (RFDS), while minimizing surface disturbance to the extent possible.

COMMENTS

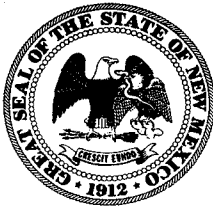
Meeting the Project Purpose

The Draft RMP/DEIS states a purpose of providing a comprehensive framework for managing the public lands and for allocating resources during the next 20 years using the principles of multiple use and sustained yield. According to the Draft RMP/DEIS, Alternative D, the preferred alternative, provides a comprehensive framework for managing public lands through balancing the extraction of the mineral resource, multiple uses of public lands, and the protection of natural and cultural resources. It can be assumed from the Draft RMP/DEIS text that Alternative D, the preferred alternative, meets the project objective as stated. However, the document provides no information regarding the need for increased oil and gas production or land use management revisions. Therefore, it is difficult to determine how the Preferred Alternative was chosen over the other alternatives evaluated, including the No Action Alternative. The range of variability between the action alternatives is minimal and therefore all of the action alternatives generate similar impacts. Please address the project need and the rationale for selection of the preferred action. This concern should be fully addressed in the Final

EIS (FEIS).

Proposed Mitigation Measures

Generally, mitigation is not addressed in the Draft RMP/DEIS text. Within Chapter 4, Environmental Consequences, discussions of some activities to reduce environmental impacts are included, but not specifically identified as mitigation commitments. An example of mitigation mentioned can be seen on Page 4-8, Paragraph 1, where the Draft RMP/DEIS mentions seeding and Best Management Practices (BMPs) as means to reduce erosion and sedimentation to watersheds. Mitigation information should be easily identified and discussed to establish a direct correlation between identified environmental impacts and proposed mitigation to minimize those impacts. Please dedicate a section in the FEIS specifically addressing all mitigation measures. This concern should be fully addressed in the FEIS.



GARY E. JOHNSON
GOVERNOR

State of New Mexico
ENVIRONMENT DEPARTMENT

Office of the Secretary

Harold Runnels Building

*1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502-6110*

Telephone (505) 827-2855 FARMINGTON, NM

Fax (505) 827-2836



JOHN D'ANTONIO, Jr.
SECRETARY

September 26, 2002

RPM Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Dear RPM Project Manager:

**RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT: FARMINGTON MANAGEMENT
PLAN AND ENVIRONMENTAL IMPACT STATEMENT; US DEPARTMENT OF THE
INTERIOR, BUREAU OF LAND MANAGEMENT; FARMINGTON FIELD OFFICE,
FARMINGTON, NM; JUNE 2002**

This transmits New Mexico Environment Department (NMED) comments concerning the above-referenced Draft Environmental Impact Statement (DEIS).

WATER QUALITY

The Bureau of Land Management Farmington Field Office (FFO) has prepared a DEIS for a Resource Management Plan (RMP) that would guide the agency in managing the resources of approximately two million acres of federal land and three million acres of other land with federal subsurface management. As the jurisdiction of FFO with regards to management of the surface is broader on federal land, the issues addressed are broader in scope for these lands, while the RMP addresses primarily gas and oil development on the remaining lands.

The five management issues addressed by the RMP are gas and oil leasing and development, land ownership adjustments, off-highway vehicle use (which includes all vehicle use off of pavement), specially designated areas (e.g., cultural resources, special habitat areas, recreation sites), and coal leasing suitability.

Gas and oil development is the management issue with greatest potential to negatively impact other resources, including water quality. Currently, nearly eighteen thousand active gas or oil wells are present within the planning area (p. 3-3). Approximately fifteen thousand miles of dirt roads serve these wells (p. 2-6), and the wells and roads themselves cover over 150 thousand acres (1.8%) within the planning area (p. 3-3).

The management alternative that would permit the smallest amount of new surface disturbance, and which FFO is proposing as the "no action" alternative, is Alternative A – Current Management. Under this alternative, approximately 4,438 new wells would be established over twenty years (Table 4-1, p. 4-5), and 14,128 acres of new surface disturbance would be associated with these and existing wells. During this period, it is also projected that 13,194 acres would be reclaimed. (See the comment below regarding the effectiveness of reclamation).

The preferred alternative, Alternative D – Balanced Approach, would permit establishment of 9,970 new wells over twenty years, approximately 31,771 acres would be disturbed, and 13,194 acres would be reclaimed.

Under either of these alternatives, "direct impacts to surface waters would result from an increase in surface disturbance, which could result in an increase in sedimentation in water bodies" (p. 4-12), and Alternative D would produce an "increase in sedimentation and salt yields due to more surface disturbance than under Alternatives [sic] A" (p. 4-101). These statements are probably true.

The New Mexico Standards for Interstate and Intrastate Surface Waters found at 20.6.4 NMAC state that "surface waters of the State shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom" (20.6.4.12.A NMAC). Furthermore, the New Mexico 2000-2002 Clean Water Act (CWA) Section 303(d) List includes three reaches of the San Juan River (Navajo Nation boundary to the Animas River, Animas River to Cañon Largo, and Cañon Largo to Navajo Dam) as currently impacted by stream bottom deposits. The San Juan River between Cañon Largo and Navajo Dam is also listed for turbidity. Two reaches of the Animas River (San Juan River to Estes Arroyo, Estes Arroyo to the Colorado border) are also listed for stream bottom deposits.

For the sake of completeness, and to supplement or replace information provided in Table 3-7 (which was probably derived from the 303(d) List), the La Plata River is listed for plant nutrients, the San Juan River between the Animas River and Cañon Largo is listed for fecal coliform, the Rio Puerco above the Rito Olguin is listed for stream bottom deposits and temperature, and the Rio San Jose is listed for temperature, pH, and stream bottom deposits. Navajo Reservoir and Lake Farmington (part of Farmington's water supply, the watershed of which is currently protected as a special management area, but would not be so protected under the preferred alternative) both contain fish with sufficient levels of mercury to be on the 303(d) List. Though not on the 303(d) List, the New Mexico State Departments of Environment, Health, and Game and Fish have developed fish consumption guidelines for the San Juan River below the Hammond Diversion due to mercury contamination.

All of these waters are also protected by the Antidegradation Policy found at 20.6.4.8 NMAC, which states (in part):

Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect

existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of watershed planning as a further means to protect surface waters of the state.

Other than the statements cited above that the preferred alternative would increase sedimentation and salt loading into water bodies (which alone may constitute water quality standards violation), no information is provided regarding other water quality parameters of interest. Mercury, turbidity, and the other parameters that limit water quality in the planning area are not mentioned in any analysis of water quality impacts of the alternatives.

Because reclamation practices and other best management practices may reduce or (conceivably) eliminate impacts to water quality of implementing any of the alternatives, scrutiny of the reclamation procedures (primarily presented in Appendix G: Conditions of Approval) is warranted. None of the alternatives as described would alter the current reclamation practices. Appendix G provides a list of procedures that a producer must agree to carry out as a condition of the lease. That a reclaimed state be attained is not a requirement. For example, guidelines for stockpiling topsoil prior to construction and re-spreading the topsoil on reclaimed portions of the well pad (p. G-1), and re-seeding of the re-spread topsoil (p. G-15) are provided, but there is no mention of criteria by which FFO can certify that the site has been reclaimed. A producer could potentially satisfy the requirements of FFO, and the reclaimed site could still be mostly barren or colonized by weeds. Although FFO may not be actively approving such reclamations, examples of well sites that have ostensibly been reclaimed but are actually still quite disturbed are abundant in the planning area under current management.

Some procedures found in the Conditions of Approval are disregarded by the producers and operators. For example, based on observations made by Surface Water Quality Bureau staff during reconnaissance for water quality survey work, the requirement that "drainage control shall be ensured over the entire road" is often disregarded. Quite often in the planning area, long stretches of road lie below grade and function as channels, accumulating large flows before discharging to gullies or arroyos. Similarly, the standard for location of access roads (p. G-13) that states, "surface disturbance and vehicular traffic will be limited to the approved location and approved access road" seems to often be disregarded. Many well sites have two or more access roads, when probably only one road was approved. Also, many intersections of roads are probably much larger than approved.

Until FFO can develop effective reclamation techniques, and consistently enforce their implementation, no decision that relies on the assumption that current reclamation procedures are effective will be valid.

Water quality impacts evaluated in the DEIS seem to be limited primarily to those affecting surface water. Potential impacts to ground water quality should be addressed by the appropriate state agency as part of implementation of the selected alternative. State regulations and standards for ground water quality in New Mexico can be found in the New Mexico Water Quality Control Commission Regulations, 20.6.2 NMAC.

The impacts of the preferred and other alternatives are not described sufficiently to evaluate their effects on water quality. A more thorough analysis of impacts and revision of reclamation policies appear to be required before an informed decision can be made by FFO whether to implement any of the alternatives.

AIR QUALITY

Coal:

Tables 2-11 and 2-12 [pgs 2-243 through 2-245] compare options and impacts of the four resource management alternatives. The potential impact from coal extraction, processing, and use should be included in these tables including, but not limited to, surface disturbance, erosion, loss of native vegetation, wildlife habitat loss, air quality over 20 years, ground water, visibility, cultural sites, paleontology, noise, and employment. Map 2.9 shows suitable areas for Alternative B. It should be retitled if it is also applicable to Alternatives C and D. Otherwise, add maps that indicate coal development areas under Alternatives C and D.

To the extent that coal development occurs, the end-to-end impacts to air quality, including extraction, processing, transportation, and potential use would have to be considered. The NMED's Air Quality Bureau (AQB) has some jurisdiction over coal mining when processing, loading, or transport are involved. The applicability of air quality regulations would be assessed at such time as a new mine was proposed. The RMP should identify the potential air quality impact of coal development under each proposed alternative and discuss how those issues will be addressed. The following paragraph would clarify these points:

"For any proposed new coal development, increase in current extraction, or use, the BLM will coordinate with all appropriate agencies of State, Federal and Tribal Governments to ensure compliance with laws and regulations. Project specific modeling and an environmental assessment will be prepared with the opportunity for public input. Air quality will be examined in conjunction with the NMED-AQB, following applicable permit procedures."

Oil and Gas:

The RMP projects a significant increase in Gas production. These VOCs will be added on top of the current baseline. Ozone levels, already near the EPA non-attainment threshold, will likely increase, since ozone results from the combination of NOx and VOCs. If the area is declared non-attainment for ozone, much stricter limitations will be applied to new and existing sources. The non-attainment designation is long term, lasting a minimum of 10 years. The RMP should address this issue, perhaps with a statement like:

"The BLM will work cooperatively with Air Quality Bureau monitoring efforts and support future mitigation activities needed to keep the planning area in compliance with state and federal air quality standards."

Ozone and Particulates:

Sources within the FFO planning area must comply with both state and federal air quality laws. EPA has added a new 8-hour standard for ozone of .084 ppm. There is also an EPA requirement for smaller particulate matter, PM2.5. The implementation language for these NAAQS has not been established yet. The old standards for 1-hour ozone and PM10 may be repealed once the implementation language is in place; however, at this time both are in effect. The RMP does not address the 8-hour ozone or PM2.5 requirements. They should be added to Table 3-14, 3-14, with an additional year (2001) column to show the monitored levels. Section 4, Air Quality, should discuss the potential impact of the proposed development on these two pollutants. Additional analysis is not required.

OHV Use:

Road construction, traffic, and OHV activity are a significant air quality issue. Particulate matter is a criteria pollutant, and the Four Corners area is susceptible to high levels. Unpaved roads increase the potential for vehicle-generated dust. Insufficient planning has been submitted to enable an assessment of the environmental impact. The RMP should consider some of the following alternatives:

- -minimize road construction,
- -require construction techniques that minimize traffic-generated dust,
- -consider dust mitigation measures for problem areas,
- -restrict road access/use,
- -develop estimating rationale for the number of road miles driven each year
- -include a statement: "In areas where blowing dust becomes a significant problem or engenders complaints, the BLM will take steps to mitigate the problem, consider closing or restricting access to roads, and coordinate with the AQB to determine the effectiveness of the steps taken."

Misstatements

Page 3-48 says "State standards, established by the NMAQB..." This is incorrect. The AQB merely enforces the state standards established by the Environmental Improvement Board (EIB).

Page 3-49 says: "The NMAQB also designates areas of the state as either in attainment or nonattainment of the NMAAQS. At the present time, the entire project region attains all national and state ambient air quality standards." AQB does not designate areas. The EPA designates areas as Attainment, Nonattainment, OR "Unclassified," (meaning that data are not available for federal standards). Based on our four monitoring stations in the Farmington area, San Juan County is currently considered in attainment for all national ambient air quality standards, although ozone is approaching the nonattainment threshold. McKinley and Rio Arriba Counties would be "unclassified" because there are presently no monitors in those locations. We are concerned about the extent of the ozone problem and are applying for funding to do temporary monitoring to evaluate the need for permanent stations.

Table 3-14 (page 3-50) contains errors on the second line under ozone. The Shiprock Substation reading should be 0.08 for 1998 and 0.09 for 2000.

Page 3-52 states: "An emission inventory is not available for the planning area within McKinley, Rio Arriba, San Juan, and Sandoval counties." This statement is untrue. We do have emissions inventories for all permitted sources and mobile sources within each county. For more information you may contact Jim Shively at (505)955-8068.

Air Quality Modeling

1. The modeling analysis doesn't include a complex terrain analysis. Most of the terrain in the project area is rugged, with substantial elevation changes, so it is likely that any single module within the proposed development will be located in an area with complex terrain. Although the analysis claims there are other conservative assumptions made, these

assumptions may not "offset" the use of simple terrain over the use of complex terrain. The submitted analysis does not necessarily provide a conservative estimate of air quality impacts from a module. While the AQB concurs that such an analysis may be impractical at this phase of the project, the RMP-DEIS should clearly state that this modeling does not include complex terrain and that the impact of these sources would likely be significantly greater in complex terrain than in simple terrain. It should also note that complex terrain modeling will be required by the AQB for each future source as part of the air quality permit process.

2. On page 13 of the Modeling Analysis Technical Report, there is a discussion of the PSD increment. This discussion seems to assume that only PSD-major sources consume PSD increment. This is not the case in the project area, as the minor source baseline date for NO₂ was established in 1989. All sources in the project area, both major and minor, consume PSD increment. Additionally, the majority of existing sources in the project area consume PSD increment. Within the project area, there are several localized areas where the available PSD Class II increment is nearly exhausted (e.g. the Bloomfield gas corridor). A permit application for a module in one of these areas would be denied, as 20.2.72 NMAC requires that new and modifying sources meet all applicable PSD increments.

3. It appears that the NMAAQs may have been incorrectly calculated for the project area elevation on pages 10 and 12. For example, assuming an average elevation in the Farmington area of around 5000 feet, the calculated 24-hour NO₂ NMAAQs should be 158.6 µg/m³ instead of 188 µg/m³ and the annual NO₂ NMAAQs should be 79.3 µg/m³ instead of 94.3 µg/m³. The AQB's Dispersion Modeling Guidelines provides the temperature and elevation correction factor for gaseous pollutants. The conclusion from table 6 on page 12 is that a single module would cause impacts that exceed the 24-hour NMAAQs for NO₂. It is possible that use of the ozone-limiting approach will bring NO₂ marginally into compliance.

4. The modeling analysis used a monitored background to represent existing concentrations. The AQB concurs that this may be appropriate for the DEIS analysis due to the very preliminary stage of this project; however, this would not be an acceptable method for a permitting analysis. It should also be recognized that the maximum monitor value may or may not be representative of the maximum NO₂ concentrations in the project area. The monitor is located in an area where there are several large sources of NO_x and CO emissions; however, the monitor may not be sited to capture the maximum concentrations from these sources. The sources in this area are on an east-west line, so maximum impacts will likely be directly to the east or west of the sources. The monitor is northwest of this group of sources. The monitor also may not be representative of all allowable (or permitted) emissions in the project area. Minor source air quality permits allow up to two years for commencement of construction from issuance of the permit and major source permits allow 18 months from issuance for commencement of construction. There are many sources that have been permitted in the project area in the last several years that may not yet be operational. This means that the monitored concentrations may not be representative of all existing allowable emissions in the project area.

5. There is no analysis of the impact of the project, existing and proposed new sources on the Class I PSD increment. The cumulative impact of existing and proposed sources on Class I areas would likely be significant. An analysis of the PSD cumulative increment consumption in Class I areas within 100 km of the project area should be completed. To make the DEIS more comprehensive, an analysis of Air Quality Related Values (AQRVs) in Class I areas should also be completed with input from the appropriate Federal Land Managers. These analyses would include, but are not limited to, visibility and deposition in the Class I areas.

6. There is no mention of other HAPs besides formaldehyde. Since there will be other HAPs emitted including BTEX, the DEIS should include a listing of these HAPs and the estimated levels of emissions, even if the emissions are so insignificant that a modeling analysis of impacts is not warranted.

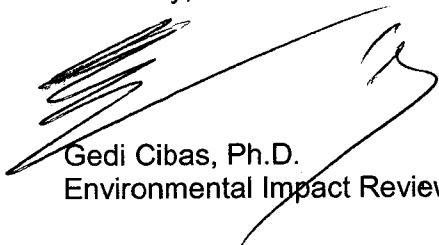
7. There is no mention of the cumulative impact of all of the modules; the analysis focus is only on the local impact of a single module. The cumulative impact of the entire project could be significant enough to increase the background concentration, increase ozone concentrations and reduce visibility in the project area. Additionally, the cumulative impact of these sources could cause significant impacts on air quality related values in nearby Class I areas. Given that there exist air quality concerns in the project area, mention of cumulative impact analysis seems appropriate for this EIS. Perhaps a statement like: "A cumulative impact analysis will be required for each future source as part of the air quality permit process." BLM is not required to conduct such an analysis, either now or later, but such a statement would indicate BLM's awareness, and define when such an analysis will be conducted.

8. This comment is for BLM awareness and requires no action or response. The overall impact of many small NOx and VOC sources associated with the proposal has the potential significantly contribute to the formation of ozone in the region. Elevated ozone concentrations have been measured in the project area. The module emissions may also contribute to the formation of regional haze since both NOx and some VOCs have a role in the formation of secondary aerosol.

Please note that for questions or clarifications on air quality modeling, you should contact Dave DuBois (955-8016) or Mary Uhl (955-8086).

We appreciate the opportunity to comment on this document.

Sincerely,

A handwritten signature in black ink, appearing to be 'Gedi Cibas', written over a horizontal line.

Gedi Cibas, Ph.D.
Environmental Impact Review Coordinator

NMED File No. 1627ER



United States Department of the Interior

FISH AND WILDLIFE SERVICE

2002 OCT 11 AM 11:33
New Mexico Ecological Services Field Office
2105 Osuna NE

070 FARMINGTON, NM
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

October 2, 2002

Cons. # 2-22-01-I-389

Memorandum

To: Field Office Manager, Bureau of Land Management, Farmington Field Office,
Farmington, New Mexico

From: Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services
Field Office, Albuquerque, New Mexico

Subject: Section 7 Consultation for the Resource Management Plan Revision, BLM
Farmington Field Office

Thank you for your Biological Assessment (BA) for the Resource Management Plan Revision, Bureau of Land Management (BLM) Farmington Field Office, New Mexico, received on September 24, 2002. You request concurrence that the activities proposed in the management plan "may affect, are not likely to adversely affect" the endangered Knowlton cactus (*Pediocactus knowltonii*), the threatened Mesa Verde cactus (*Sclerocactus mesae-verde*), the endangered Mancos milkvetch (*Astragalus humillimus*), the endangered Colorado pikeminnow (*Ptychocheilus lucius*) and its critical habitat, the endangered razorback sucker (*Xyrauchen texanus*), the threatened bald eagle (*Haliaeetus leucocephalus*), the proposed threatened mountain plover (*Charadrius montanus*), the threatened Mexican spotted owl (*Strix occidentalis lucida*) and its critical habitat, and the endangered southwestern willow flycatcher (*Empidonax trailii extimus*).

The Resource Management Plan/Environmental Impact Statement presents four alternatives of which Alternative D is the preferred alternative. Under this alternative it is anticipated that 9,942 new oil and gas wells will be developed on land overlaying Federal minerals over the next 20 years. These include surface lands managed by BLM, Bureau of Reclamation, the State of New Mexico, and private land. Approximately 805 miles of new roads will be needed for the new well development.

Specially Designated Areas and Areas of Critical Environmental Concern would protect riparian resources, and Mexican spotted owl critical habitat. Most of these would limit Off-Highway Vehicle (OHV) use. The coal program would drop the existing Coal Belt Special Management Area because all areas that are suitable for coal mining would be available for consideration for


extraction under the lease by application process. Approximately 378,875 acres of Federal land would be available for coal leasing.

The management plan revision proposes to change the OHV designation on BLM surface lands from open to limited. Currently the majority of BLM surface lands have an open designation permitting cross-country travel. Because of the high density of oil field roads in the San Juan Basin (15,000 to 20,000 miles), the change in designation should have little impact on accessibility to any area. However, because of the public desire for OHV areas, two recreational areas previously designated for open OHV use will remain open areas. Approximately 94 miles of OHV trails are identified in the preferred alternative. Future development of OHV trails will be determined in OHV management plans.

A coordination meeting was held between our respective staffs on July 30, 2002, to discuss the threatened and endangered species present in the planning area, and how they might be affected by the proposed actions. A primary concern of my staff regarded the amount of water that would be needed for the drilling of the oil and gas wells in relationship to the minor depletions limit present within the San Juan Basin. However, because BLM is requiring that the water acquired for oil and gas development must be purchased from a business with a legal water rights permit, and the amount of water allotted to water haulers is monitored by the State, we are satisfied that the amount of water used will not exceed that allowed by the minor depletions limit.

The U.S. Fish and Wildlife Service (Service) concurs with the BLM's determination in the BA of "may affect, not likely to adversely affect" Knowlton cactus, Mesa Verde cactus, Mancos milkvetch, Colorado pikeminnow and its critical habitat, razorback sucker, bald eagle, mountain plover, Mexican spotted owl and its critical habitat, and the southwestern willow flycatcher. Please contact the Service if: 1) future surveys find threatened or endangered species in areas where they have not been previously observed; 2) the management activities change, or new information reveals effects of the actions to the listed species or their habitat to an extent not considered in the BA; or 3) a new species is listed that may be affected by these projects.

This concludes section 7 consultation on the proposed Resource Management Plan Revision, BLM Farmington Office. We appreciate your staff's cooperation, coordination, concern for threatened and endangered species, and timely responses to our requests for additional information. If you have any questions, please contact Marilyn Myers at the letterhead address or at (505) 346-2525, ext. 154.


for Joy E. Nicholopoulos

cc:

Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
State Director, Bureau of Land Management, Santa Fe, New Mexico



USDA Forest Service
San Juan National Forest
<http://www.fs.fed.us/r2/sanjuan>

San Juan Public Lands Center
15 Burnett Court
Durango, CO 81301

Ph (970) 247-4874 Fax (970) 385-1243



USDI Bureau of Land Management
San Juan Center
<http://www.co.blm.gov/>

2002 OCT 15 PM 2:30
070 FARMINGTON, NM

File Code: 2580-2

Date: October 10, 2002

Jim Ramakka
RMP Project Manager
Farmington BLM Field Office
1235 La Plata Highway
Suite A
Farmington, NM 87401-8754

Dear Jim:

We have reviewed the Farmington Draft Resource Management Plan and EIS. Our comments primarily relate to impacts management activities analyzed in the EIS may have on air quality and the Weminuche Wilderness. As you may know, the Weminuche Wilderness is a Class I area that receives the highest level of visibility protection provided by Congress, the Clean Air Act, and the State of Colorado. It is also documented as having among the most pristine air quality in the United States.

The San Juan National Forest has several comments and questions we feel would be helpful if addressed by the Farmington Field Office:

1. There is no analysis of the effects oil and gas development will have on the Weminuche Wilderness Class I Area. The EIS acknowledges there will be significant impacts to the Mesa Verde National Park Class I Area. In this light, it is critical to have some disclosure of the potential impacts to the nearby Weminuche Wilderness on the San Juan National Forest.
2. The alternative having the highest potential impact to air quality (Alt. B), was the only alternative analyzed in detail. This alternative was shown to have large air quality impacts to Class I Areas that exceed levels allowed by the Clean Air Act. It is not possible to assess the potential impacts of any other alternative that may have lower, more acceptable impacts, since modeling did not occur and impacts were not disclosed. It is critical to have visibility impacts to Class I Areas, including the Weminuche Wilderness, disclosed for each alternative.
3. There is no documentation of a detailed emissions inventory in either the Draft EIS or the Air Quality Modeling Analysis Technical Report. Were the cumulative impacts of the oil and gas development associated with the Southern Ute EIS and Northern San Juan Basin EIS of Colorado used when analyzing cumulative impacts to Class I Areas? It is difficult to assess whether existing and reasonably foreseeable emissions sources in the Four




Corners area were analyzed for cumulative effects. For example, the proposed Mustang Energy coal-fired power plant south of Farmington is currently undergoing the PSD permitting process. Was this large future emissions source included in the emissions inventory?

4. The far field analysis is only qualitative, and inadequate to accurately disclose impacts to Class I Areas. Again, given the disclosure that large air quality impacts are predicted for Mesa Verde National Park, a quantitative far field analysis for each alternative is critical to disclose legal compliance to visibility protection in the Weminuche Wilderness Class I Area.

Detailed comments regarding modeling protocol and modeling results compiled by air quality staff in our Regional Office are attached to this correspondence. We appreciate the opportunity to comment, and to work cooperatively with air quality analyses for all the NEPA documents in the San Juan Basin. If there are any questions, please feel free to contact Kelly Shanahan at (970) 385-1232.

Sincerely,


for RICK BRAZEIL
Acting Forest Supervisor

cc: Walter A Brown, Christopher T Hockett

Kelly, your letter looks very good. I have a few comment and concerns identified below. If you can incorporate them into your letter, please feel free to do so. I tried to get these to you last week, but it was just not possible with all that is going on right now. I'm sorry about that. Have a great afternoon, Chris

1. The installation and operation of this source may have a substantial impact on the air quality and visibility in nearby wilderness areas administered by the Forest Service. As evidenced by the potential increase in emissions identified in the EIS, this project could have a significant impact on air quality related values (AQRV) over a substantial geographic area. In fact, the EIS states that the project "would potentially produce significant cumulative impacts to visibility resources in Mesa Verde and San Pedro Parks Class 1 areas." Given increases in emissions (e.g. NOx will increase nearly 70,000 tons per year) modeling could potentially identify impacts hundreds of kilometers away from this source. However, no such refined modeling was performed nor was a PSD increment or other AQR analysis included in the EIS. Furthermore, and of great concern is the treatment of the Clean Air Act Prevention of Significant Deterioration (PSD) regulatory requirements. On page 4-61 of the EIS, BLM states that, even though this project will exceed the threshold for PSD applicability and the allowable annual the PSD Class II increment, no PSD review is necessary. The basis for this statement seems to relate to BLM's determination that each wellhead compressor, and other sources, will be reviewed on an individual basis.

However, this approach may be contrary to both the PSD implementing regulations and EPA permitting policy. With respect to the PSD rules, 40 CFR 52.21 states that a regulated stationary source is "any building, structure, or installation that emits or may emit any air pollutant subject to regulation under the Clean Air Act." Moreover, the regulations go on to define a "building, structure or installation as all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of any vessel. Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same first two digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement (U. S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively). Furthermore, an emissions unit is defined as "any part of a stationary source which emits or would have the potential to emit any pollutant subject to regulation under the Act. Because the language in the PSD implementing regulations state that "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person" constitute a single source, we believe that this project should be reviewed as such.

In light of the information above, coupled the very large amounts of criteria pollutants that will be emitted and the potential PSD increment impact, we believe the minimal modeling and reliance on the Southern Ute Oil and Gas EIS for the purpose of inferring impacts on the surrounding area is inappropriate. Also, this approach seems lack

sufficient environmental analysis to determine if BLM's action on this project will meet its affirmative obligation under section 176 of the Clean Air Act. It appears that a full air quality impact analysis, including PSD increment and AQRV impacts should be performed for this project.

2. On page 3-48 of the EIS, BLM states that volatile organic compounds, nitrogen oxides, nitrogen dioxide, carbon monoxide, and particulate matter less than 10 microns in diameter are pollutants of concern. EPA identifies each of these pollutants as criteria or precursors for criteria pollutants. The EIS goes on to identify all pollutants except ozone and its precursors as "inert." Inert is defined as displaying no chemical activity. Section 108 of the Clean Air Act states that "For the purpose of establishing national primary and secondary ambient air quality standards, the Administrator shall within 30 days after the date of enactment of the Clean Air Amendments of 1970 publish, and shall from time to time thereafter revise, a list which includes each air pollutant (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare..." The pollutants identified in the EIS fall into this category. Calling them "inert" seems to be misleading and inappropriate.

Moreover, the EIS states that the region of influence for "inert" pollutants is limited to a few miles downwind of the source. On what modeling did BLM base this statement? Additionally, does BLM have data that shows that the nitrogen-based and sulfur-based pollutants will not impact acid deposition, visibility or other AQRVs in nearby wilderness areas?

3. On page 3-50, table 3-14 identifies the current air quality status for project region. Furthermore, BLM states that the data in Table 3-14 indicates that ambient air quality for the project region is in attainment with state and federal ambient air quality standards. However, the Shiprock Substation indicates that ozone concentrations were measured as high as .90 microgram per cubic meter. This is considerable higher than the NAAQS (approximately 650% above the NAAQS). Is this area at risk for being redesignated to nonattainment or was that a single event?



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

RECEIVED
2002 OCT 28 PM 12:23

070 FARMINGTON, NM

OCT 24 2002

Mr. Steve Henke
Field Office Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Dear Mr. Henke:

Thank you for the opportunity to extend our comments on the Draft Environmental Impact Statement (DEIS) for the proposed revisions to the management plan for Federal lands in San Juan, McKinley, Rio Arriba, and Sandoval counties, New Mexico. The attached comments reiterate certain aspects of the discussion that took place in Santa Fe, New Mexico on September 16, 2002. This letter is the extent of comments on air quality contemplated in the comment letter from the Environmental Protection Agency dated September 25, 2002.

If you have any questions or need further clarification on the attached comments feel free to contact me or Mr. Quang Nguyen of my staff at 214-665-7238.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas Diggs".

Thomas Diggs, Section Chief
Air Planning

Comments on the Air Quality Near-Field Modeling for The Revised Farmington and Rio Puerco RMPS EIS

1. Air dispersion modeling is very sensitive to the relationship between emission source locations and terrain features. The Industrial Source Complex Short-Term Model 3 (ISCST3), recommended for use only in simple terrain situations, was used in the current analysis to estimate the maximum impact from the proposed emission sources. Because the project area is located in or close to complex terrain (i.e. substantial elevation changes), EPA recommends that BLM conduct a complex terrain modeling analysis to estimate the maximum impact from the proposed emission sources to augment the current modeling analysis. The proposed emissions module in the current analysis, based on the Dakota formation, is reasonable and conservative. These same assumptions can be used in the complex terrain modeling analysis since the spatial allocation of any single module within the proposed development is not known at this time. This modeling analysis should still address increments in the Prevention of Significant Deterioration and NAAQS attainment concerns for all criteria pollutants. EPA is concerned about the volume of possible emissions on a cumulative basis.

2. Oxide of Nitrogen (NO_x) is one of the main pollutants emitted from natural gas combustion. In certain areas NO_x has been identified as the dominant pollutant contributing to ozone nonattainment. The current analysis does not resolve this question, but nearby sources are emitting NO_x and are reasonably suspected of inducing elevated ozone levels that have been recorded in the area. EPA recommends that a cumulative impact analysis be conducted to prevent violations of the ozone NAAQS. As in the existing study, we recommend that the modeling project future emissions under different development scenarios.

3. No cumulative impact analyses of the proposed new sources and existing sources on Class I areas was conducted. Since the project area is within 100 km of Class I areas, EPA recommends a Class I area impact analysis (i.e., Air Quality Related Values (AQRV) analysis) be conducted to ensure that the proposed emissions module will not cause adverse impacts on Class I areas. Appropriate Federal Land Managers should be consulted for inputs necessary for a complete AQRV impact analysis of the proposed emissions module.